AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE	OF	PAGES
	1		2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
0002	31 AUG 2000		

6. ISSUED BY	CODE	7. ADMINISTERED BY *(If other than Item 6)*	CODE
US ARMY ENGINEER DISTRICT, FORT WORTH ATTN: CESWF-CT (RM 2A19) PO BOX 17300 FORT WORTH, TX 76102-0300			

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*	(X)	9A. AMENDMENT OF SOLICIATION NO.
	☒	DACA63-00-B-0029
		9B. DATED *(SEE ITEM 11)* 28 JULY 2000
	☐	10A. MODIFICATION OF CONTRACT/ORDER NO.
		10B. DATED *(SEE ITEM 11)*
CODE / FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☒ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a)By completing items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER *(Specify type of modification and authority)*

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (*Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

The Solicitation for DRFF AND TANK TRAILS, FORT HOOD, TEXAS, is amended as follows:

See Continuation Sheet.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
15B. CONTRACTOR/OFFEROR *(Signature of person authorized to sign)*	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA *(Signature of Contracting Officer)*	16C. DATE SIGNED

Item 14. Continued.

CHANGES TO SF1442

1. Item 13.A.- Change the Bid Opening time and date from “1400 (hour) local time **6 September 2000**” to **“1400 (hour) local time 11 September 2000”.**

CHANGES TO SPECIFICATIONS

2. Replacement Sections - Replace the following sections with the accompanying new sections of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-00-B-0029:"

SECTION 01420	STORMWATER POLLUTION PREVENTION PLAN
SECTION 02241	AGGREGATE BASE COURSE FOR SHOULDERS, SUBBASE, BASE OR OPEN SURFACES
SECTION 02565	EMULSIFIED ASPHALT BASE TREATMENT
SECTION 02754	CONCRETE PAVEMENTS

CHANGES TO THE DRAWINGS

3. Replacement Drawings.- Replace the drawings listed below with the attached new drawings(s) of the same number, bearing the notation "AM #0002":

I001_2.cal I-001 INDEX SHEET
C001_2.cal C-001 PROJECT LOCATION MAP
C181_2.cal C-181 STORM WATER POLLUTION PREVENTION PLAN
C182_2.cal C-182 STORM WATER POLLUTION PREVENTION PLAN
C183_2.cal C-183 STORM WATER POLLUTION PREVENTION PLAN
C184_2.cal C-184 STORM WATER POLLUTION PREVENTION PLAN
C185_2.cal C-185 STORM WATER POLLUTION PREVENTION PLAN
C186_2.cal C-186 STORM WATER POLLUTION PREVENTION PLAN
C187_2.cal C-187 STORM WATER POLLUTION PREVENTION PLAN
C188_2.cal C-188 STORM WATER POLLUTION PREVENTION PLAN
C189_2.cal C-189 STORM WATER POLLUTION PREVENTION PLAN
C190_2.cal C-190 STORM WATER POLLUTION PREVENTION PLAN
C191_2.cal C-191 STORM WATER POLLUTION PREVENTION PLAN
C192_2.cal C-192 STORM WATER POLLUTION PREVENTION PLAN
C193_2.cal C-193 STORM WATER POLLUTION PREVENTION PLAN
C194_2.cal C-194 STORM WATER POLLUTION PREVENTION PLAN
C195_2.cal C-195 STORM WATER POLLUTION PREVENTION PLAN
C196_2.cal C-196 STORM WATER POLLUTION PREVENTION PLAN
C197_2.cal C-197 STORM WATER POLLUTION PREVENTION PLAN
C198_2.cal C-198 STORM WATER POLLUTION PREVENTION PLAN
C199_2.cal C-199 STORM WATER POLLUTION PREVENTION PLAN
C200_2.cal C-200 DRRF OPTION-STORM WATER POLL. PREVENTION PLAN 1
C201_2.cal C-201 DRRF OPTION-STORM WATER POLL. PREVENTION PLAN 2
C501_2.cal C-501 TYPICAL SECTIONS
C507_2.cal C-507 STORM WATER POLLUTION PREVENTION DETAILS

END OF AMENDMENT

SECTION 01420

STORMWATER POLLUTION PREVENTION PLAN
AMENDMENT NO.0002

PART 1 GENERAL

1.1 SUMMARY

This Section provides an outline of a basic Stormwater Pollution Prevention Plan (SWPPP) for a National Pollutant Discharge Elimination System (NPDES) General Permit.

1.2 PROJECT IDENTIFICATION AND NOTES

PROJECT TITLE: Deployment Ready Reaction Field and Tank Trails

LOCATION: Fort Hood, TEXAS

1.3 PROJECT DESCRIPTION

The purpose of this project is to provide all-weather facilities to allow military vehicles to travel to the rail yard for rail shipment in support of mobilization or other transport needs. The current conditions consist of unimproved trails and an unpaved assembly area (the Deployment Ready Reaction Field; DRRF), which vary from extremely dusty conditions during dry weather to muddy conditions during wet weather. The proposed improvements at Fort Hood consist of three primary elements for construction of this project. These elements are:

- Grading and surfacing of approximately 68,400 square meters of DRRF site.

- Grading and surfacing of approximately 9.25 kilometers of existing unimproved tank trails to connect the DRRF and ammunition upload facility to the new railhead. The width of the tank trails is 9.0 meters, except between the railhead and the intersection of Turkey Run Road and Clarke Road where it is 7 meters.

- Development of ammunition upload facility consisting of 10 ammunition upload stations and a truck road for transporting ammunition to the upload stations.

Supporting facilities will include electric and lighting protection. Storm drainage features that are included in the project are culverts, concrete headwalls, low water crossings, and manholes. The base bid for the project will consist of the DRRF field, tank trails and ammunition upload facility. The total area of disturbance measures approximately 19.4 hectacres. The bid options include the expansion of the DRRF and lighting of the DRRF.

1.4 STANDARD INDUSTRIAL CLASSIFICATION (SIC)

The construction activities associated with this project have the following SIC codes in accordance with the Standard Industrial Classification Manual published by the Office of Management and Budget (OMB).

1629 - Heavy Construction, Not Elsewhere Classified (i.e. athletic fields, bridle paths, canal construction and grubbing, cofferdams, dikes, boat docks, drainage projects, flood control projects, levees, pond construction, railroads, reservoirs, sewage treatment plants, water treatment plants).

1771 - Concrete Work (includes asphalt, i.e. access drives and parking lots, culvert construction).

9711 - National Security (a general category for military facilities).

1.5 LOCATION

The improved DRRF is located at the eastern end of the project. The DRRF is located on the north side of North Avenue east of the intersection of North Avenue and West Range Road which is at the same location as the existing DRRF site. The DRRF is located on the main base at approximately latitude 31° 09' 35" north and longitude 97° 46' 20" west. The improved tank trails approximately follows the same alignment as the existing tank trails from the DRRF to a point approximately 800 meters south of the intersection of Clarke Road and Turkey Run Road. From this intersection the alignment runs to the west and then south where it crosses Tank Destroyer Road near the intersection of Tank Destroyer Road and Logistics Avenue, and then continues to the entrance of the new railhead. The entrance to the railhead is approximately at latitude 31° 07' 17" and longitude 97° 51' 45." The ammunition upload facility is located along the alignment of the tank trails approximately 900 meters north of the intersection of the tank trails with Tank Destroyer Road. The facility consists of 10 ammunition upload pads and a truck road from Tank Destroyer Road to the ammunition upload facility. The project entirety goes through two different counties, Coryell and Bell counties.

1.6 RECEIVING WATERS

The sites for the DRRF, tank trails and ammunition upload facility are located on the Brazos River watershed. All storm water received on the construction sites will collect into tributaries draining into Clear Creek that ultimately flows into Cowhouse Creek. Cowhouse Creek is a main tributary flowing into Belton Lake. Belton Lake was constructed on the Leon River that ultimately flows into the Brazos River.

PART 2 SITE DESCRIPTION

2.1 EXISTING CONDITIONS

The proposed site for construction of the DRRF is in the same location as the existing site. The site is currently unpaved, with no vegetation, and encompasses an area of approximately 104,000 square meters. The site slopes towards the north and west at a slope of approximately 2 percent. The runoff sheet flows into drainage ditches that ultimately flows to the Clear Creek. The proposed tank trails between the DRRF and the railhead follows the same alignment as the existing trails. The existing tank trails are unpaved, with no vegetation, and approximately 12 kilometers long. The runoff flows into ditches along the trails that ultimately flows into Clear Creek. The ammunition upload facility site is located between the intersection of the tank trails with Tank Destroyer Road and where the trail deviates from Clarke Road. Runoff sheet flows into small draws that

make up the headwaters of Clear Creek. The normal annual precipitation for the area is 780 mm. The runoff coefficient for the area is 0.3. This is based on an unimproved area that consists of a black or loessial soil with a slope ranging from 3 percent to 5 percent.

2.2 FUTURE CONDITIONS

Upon completion of the project for the DRRF, tank trails, and ammunition upload facility, the storm water will follow the same drainage pattern as the existing sites that will ultimately lead into Clear Creek. Although the existing DRRF site and tank trails contained no vegetation, the paved improvement will increase the runoff coefficient (C = 0.95). The unpaved ground adjacent to the north side of the DRRF is stabilized with erosion control fabric to reduce the erosion potential from the runoff from the DRRF site.

2.3 CONSTRUCTION PHASING

The following is the construction phasing and traffic maintenance for this project. The anticipated length of this contract is approximately 365 days for Base Bid and an additional 90 days for bid options. The project start date is approximately November 1, 2000 and completion will be November, 2001 for Base Bid and approximately February 2000 for Bid Option 1, not including anticipated weather days.

The Contractor's Detailed SWPPP shall reference the bid document to update the executed options and subsequent construction activities. The following major construction activities are anticipated for this project:

Mobilization of Contractor and establishing storm water pollution prevention control structures.
Clearing and Grubbing - The limit of clearing and grubbing will be the same as the approximate limit of grading shown on the civil drawings.

Construction Phasing - Base Bid will include construction of the DRRF site, tank trails and ammunition upload facility. Bid options will include expansion of the DRRF and area lighting. Depending on bids received, all options may be awarded or possibly none.

Grading and Drainage - Permanent drainage swales will be constructed along the tank trails.

Site Stabilization - All sites disturbed by Contractor activities will be stabilized temporarily and permanently in accordance with paragraph 3.0, EROSION AND SEDIMENT CONTROLS.

Removal of storm water control structures after establishment of final stabilization and approval of Contracting Officer.

2.4 SOILS DATA

The following soil information is from the Soil Survey of Coryell County, Texas, issued May 1985 by the United States Department of Agriculture, Soil Conservation Service. This is in cooperation with the Texas Agricultural Experimental Station and the United States Department of the Army, Fort Hood, Texas. The site is located on soils mapped as Nuff-Cho association. The predominate soils on this site are characterized as nearly level to

sloping; very shallow to moderately deep; dark clay, sandy gravelly soils over limestone. Permeability is moderate to moderately slow, in the upper layers; however, it is slow in the caliche layers. Water capacity tends to range from low to high, depending on the incidence of rock. Runoff is medium and the hazard of erosion is moderate. Shrink-swell potential ranges from low to moderate. Soil reaction tends to be moderately alkaline (pH = 7.9 - 8.4) and the root zone tends to be relatively shallow and rocky, which can hinder the establishment of grasses. Unified classification of the surface layer is CL and CH, and the subsoil is CL, CH, SM-SC, SC, GC, and GM-GC.

2.5 DRAWINGS

Contract drawings include the plan and profile drawings of the tank trails, DRRF geometry plans, grading and drainage plans of the tank trails and DRRF site, storm water pollution prevention plans, and other details. Disturbed areas associated with the various items of work will be within these limits. Attached drawings to the basic SWPPP provide details for the layout and construction of storm water control features required to alleviate erosion potential during the construction phase of this project. The following is a list of the SWPPP drawings:

Sheet #	Description
C-001	PROJECT LOCATION MAP
C-181	STORM WATER POLLUTION PREVENTION PLAN
C-182	STORM WATER POLLUTION PREVENTION PLAN
C-183	STORM WATER POLLUTION PREVENTION PLAN
C-184	STORM WATER POLLUTION PREVENTION PLAN
C-185	STORM WATER POLLUTION PREVENTION PLAN
C-186	STORM WATER POLLUTION PREVENTION PLAN
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C-197	STORM WATER POLLUTION PREVENTION PLAN
C-198	STORM WATER POLLUTION PREVENTION PLAN
C-199	STORM WATER POLLUTION PREVENTION PLAN
C-200	DRRF OPTION-STORM WATER POLL. PREVENTION PLAN 1
C-201	DRRF OPTION-STORM WATER POLL. PREVENTION PLAN 2
C-507	STORM WATER POLLUTION PREVENTION PLAN DETAILS

PART 3 EROSION AND SEDIMENT CONTROLS

3.1 TEMPORARY STABILIZATION

During periods when establishment of turf is not contractually approved, all unpaved, graded, and disturbed portions of the site where construction activity temporarily ceases for at least 21 days will be stabilized with a hay mulch no later than 14 days from the last construction activity in that area. Before mulching, 180 kilograms of 15-15-10 fertilizer shall be applied to each hectare prior to tilling. After fertilizing and tilling,

each area shall be mulched with hay at the rate of 3.18 metric tons per hectare. The hay mulch is to be replaced with straight rolling coulters spaced not more than 203 mm apart. Details for mulching are described in Section 02940 - MULCHING FOR EROSION CONTROL, which is included in the advertised documents for this project.

3.2 PERMANENT STABILIZATION

During periods when establishment of turf is contractually approved, disturbed portions of the site where construction activities permanently cease will be stabilized within 14 days after the construction activity. Grass seed will be applied according to Section 02933 - ESTABLISHMENT OF TURF. Maintenance will consist of watering, refertilizing, mowing, and repair of erosion damage. Structural controls shall be removed after establishment of final stabilization and acceptance of Contracting Officer. Final stabilization is accomplished when vegetation at the disturbed areas has achieved 70% of the background native vegetation.

3.3 STRUCTURAL CONTROLS

The Contractor shall use silt fences, check dams, and other appropriate type of structural controls necessary to prevent soil erosion at the construction site. In general, storm controls shall be used along the perimeter of grading, at each new and existing storm inlets and culverts and the drainage swales. Erosion and sediment control details are depicted on Sheet C-507 of the contract plans and specifications.

3.3.1 Silt Fence

Silt fences consist of geotextile fabric supported by poultry netting or other backing stretched between either wooden or metal posts with the lower edge of the fabric securely embedded in the soil. The fence is typically located downstream of disturbed areas to intercept runoff in the form of sheet flow. A silt fence provides both filtration and time for sedimentation to reduce sediment and it reduces the velocity of the runoff. A properly designed silt fence is economical since it can be relocated during construction and reused on their projects.

Silt fences are normally used as perimeter controls located downstream of disturbed areas. It is only feasible for non-concentrated, sheet flow conditions. Silt fences are an economical means to treat overland, non-concentrated flows for all types of projects. Silt fences are used as perimeter control devices for both site developments and linear type projects. They are most effective with coarse to silty soil types. Due to the potential of clogging, silt fence should not be used with clay soil types.

3.3.2 Check Dams

Check dams are small barriers consisting of rock placed across a drainage swale or ditch. They reduce the velocity of small concentrated flows, provide a limited barrier for sediment and help disperse concentrated flows, reducing potential erosion.

Check dams are used for long drainage swales or ditches in which permanent vegetation may not be established and erosive velocities are present. They

are typically used in conjunction with other techniques such as inlet protection, riprap or other sediment reduction techniques. Check dams provide limited treatment. They are more useful in reducing flow to acceptable levels for other techniques.

Check dams are typically used early in construction in swales for long linear projects such as tank trails. They can also be used in short swales with a steep slope to reduce unacceptable velocities. Check dams should be placed at a distance and height to allow small pools to form between each one. Typically, dam height should be between 0.5 meters ad 1.0 meters. Dams should be spaced such that the top of the downstream dam should be at the same elevation as the toe of the upstream dam.

3.3.3 Stabilized Construction Entrance

A stabilized construction entrance consists of a pad of gravel, crushed stone, recycled concrete or other rock like material on top of geotextile filter cloth to facilitate the wash down and removal of sediment and other debris from construction equipment prior to exiting the construction site.

Stabilized construction entrances are used primarily for sites in which significant truck traffic occurs on a daily basis. It reduces the need to remove sediment from streets. Stabilized construction entrances are to be constructed such that drainage across the entrance is directed to a controlled, stabilized outlet on site with provisions for storage, proper filtration, and removal of water. The entrance must be properly graded so that storm water is not allowed to leave the site and enter roadways. The minimum width of the entrance shall be 4.5 meters, but in no case shall the width be less than that of the entryway. Finally, the minimum depth of entrance shall be 205 mm.

PART 4 STORM WATER MANAGEMENT CONTROLS

During construction of the project, it is anticipated that the duration and quality of storm water runoff will decrease due to initial ground conditions at the site. However, the decrease in quality will not be significant since the existing DRRF site and Tank Trails were bare ground, no vegetation. The initial DRRF site has a runoff coefficient of 0.70 and a steep slope of 2 percent. The project will be constructed in a cut section throughout the site. After completion of the project, runoff will increase because of the new asphalt and concrete pavements. The runoff coefficient will increase to 0.95 for the area. Grading of the site will produce a much more gradual slope than was existing.

The following storm water management controls will be included as permanent features upon completion of this project. All features were designed considering the 10-year storm frequency for Coryell County and use of the rational method.

4.1 Drainage Swales and Ditches

Drainage swales and ditches will be utilized as a permanent feature to control storm water for this project. V-ditches will be used along the trails. The side slopes and bottom of the swales will be established by turfing.

4.2 Drainage Culverts

Tank Trails:
There are thirteen (13) pipe culverts to be constructed within the proposed tank trails. These culverts will range from 375 mm to 1350 mm in diameter. In several areas, multiple pipe culverts will be utilized. The culverts will empty into drainage swales that direct flow away from the site towards Clear Creek to the south.
Text

PART 5 BEST MANAGEMENT PRACTICES (BMP) DURING CONSTRUCTION

The construction Contractor or its subcontractors shall be responsible for minimizing erosion and controlling sediment in storm runoff. Contractor shall address Best Management Practices (BMPS) to prevent storm water pollution.

5.1 Waste Materials

Solid waste materials (trash and construction debris) shall be placed in appropriate waste containers and covered. Waste containers shall be emptied regularly; they shall not be allowed to overflow. The disposal area of excavated materials from project construction shall not be utilized for waste disposal. Routine janitorial service shall be provided for all construction buildings and surrounding grounds. No construction waste materials, including concrete, shall be buried or otherwise disposed on-site. All site personnel shall be briefed on the correct procedures for solid waste disposal.

5.2 Hazardous Waste

No hazardous waste was identified at the sites, however, if hazardous wastes are uncovered, hazardous waste shall be handled, stored, and disposed in accordance with all Federal, State and local regulations and before all other construction activities. Chemical waste shall be stored in clearly labeled corrosion-resistant containers, and stored in designated areas before removal from site. Materials more than job requirements shall not be stored on-site. All site personnel shall be briefed on the correct procedures for hazardous waste disposal.

5.3 Sanitary Waste

On-site sanitary facilities shall be established. Facility location, design, maintenance, and waste collection practices shall be in accordance with local regulations.

5.4 Off-Site Vehicle Tracking and Dust

Every effort shall be made to keep vehicles from tracking soils from the construction site, access points, material borrow, and disposal area. The Contractor shall identify entrances or access points to the construction site, on-site and off-site borrow and disposal areas and types of storm water structural controls needed at these areas on the SWPPP drawings. Dust generation shall be controlled by sprinkling, chemical treatment, light bituminous treatment, or similar methods. Materials hauled from the construction site in open-bed vehicles shall be covered or otherwise

stabilized to avoid their loss during transport.

Temporary parking area (s) to be used 30 calendar days for the Contractor's equipment or personal vehicles shall be paved with base material per specification and it shall be removed by the Contractor upon project completion. The Contractor shall stabilize the disturbed area in accordance with paragraph PERMANENT STABILIZATION.

5.5 FERTILIZERS

If fertilizers are used, they shall be applied in accordance with the specifications, i.e. in the stated amounts and only when weather conditions are appropriate.

5.6 CONSTRUCTION VEHICLE MAINTENANCE AND REPAIR

Specific areas shall be designated for equipment maintenance and repair to minimize potential impact on storm water run-off. All construction vehicles shall be regularly inspected for leaks and receive regularly scheduled maintenance to reduce the potential for leaks.

5.7 VEHICLE FUELING

Vehicle fueling at project site shall be conducted in accordance with good safety practices to reduce the potential for leaks and spills. Only properly constructed fuel containers shall be used on site and shall be labeled and stored in accordance with applicable codes. Washing and curing waters shall be drained into a retention basin constructed by the Contractor and are to be cleaned up by the Contractor to the satisfaction of the Contracting Officer after the project completion.

PART 6 TIMING OF CONTROLS AND ACTIVITIES.

Temporary and permanent stabilization will be established in accordance with paragraph 3, Erosion and Sediment Controls. When construction temporarily ceases, erosion controls shall be established in accordance with paragraph 3.1, Temporary Stabilization. The Contractor shall identify the detail sequence and control activities for the construction process.

PART 7 COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

This project complies with the National Environmental Policy Act of 1969. The project-planning document 1391, prepared in June 1997, indicated that a Record of Environmental consideration was preformed and signed by the installation on 12 August 1998. It was determined that this project qualifies for a categorical exclusion A-7, Appendix A, AR 200-2, because the proposed area has been previously disturbed by the construction of the existing railroad and previous military training activities. Additionally, there are no threatened or endangered species habitats in the area, agricultural lands, coastal zones, wilderness areas, aquifers, or wild and scenic rivers that will be affected by construction of this project.

The project does not encroach on a floodplain or wetland. Additionally, review procedures for historic and archeological sites have been implemented for this project in accordance with 36 CFR 800. The review has established that there will be no impact to archeological sites.

In accordance with AR 200-1, all Department of Defense installations and their construction contractors are required to comply with Federal environmental protection statutes, which include a provision to observe local environmental regulations. The Contractor shall comply with Texas Administrative Code (TAC), county, and local applicable environmental regulations.

PART 8 MAINTENANCE AND INSPECTION PROCEDURES

The Contractor's quality control organization shall inspect all pollution prevention measures at least once every seven (7) days and within twenty-four (24) hours following any storm producing 13 mm (0.5 inches). The inspector shall thoroughly understand the requirements of the Contractor's SWPPP and shall have a basic knowledge of the engineering principles for reducing runoff pollution.

Temporary grading shall be inspected for erosion and soil loss from the site. Temporary erosion control measures shall be inspected for bare spots and washouts. The inspector shall inspect discharge point for signs of erosion or sediment. Locations where vehicles enter and leave the site shall be checked for signs of off-site sediment tracking, including erosion control at material borrow and disposal areas. Best Management Practices and pollution control maintenance procedures shall be reviewed for adequate erosion control by the Contractor during project execution. All deficiencies shall be noted in the inspection reports and submitted to the Contracting Officer after each inspection. Corrections to these problems shall be implemented within seven (7) calendar days. The Contractor shall comply with the NPDES permit requirements to prepare the INSPECTION and MAINTENANCE REPORT after each inspection event. These reports shall be posted on the project bulletin board and kept in the project file on site. The SWPPP shall be revised as necessary. After final stabilization has been achieved, the Contractor shall inspect the site once a month until final inspection and project acceptance by the Contracting Officer.

PART 9 MATERIAL INVENTORY

The following materials or substances brought may be present on-site during construction shall have a Material Safety Data Sheet (MSDS) available to the Contracting Officer. These materials include concrete, paints, sealants, petroleum-based products, cleaning solvents, fertilizers, tar, asphalt, and steel reinforcing bars. The list of materials and the respective material safety data sheets (MSDS) shall be included withstated in the Contractor's detailed SWPPP.

PART 10 NON-STORM WATER DISCHARGE

Non-storm water discharges shall not be allowed during construction of the project except for emergency fire-fighting flows and other flows permitted in accordance with 63 FR 128, July 6, 1998 as referenced in paragraph, COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. In addition, any spill of a hazardous substance or oil more than reporting quantities shall be reported as required under 40 CFR 110.

PART 11 CONTRACTOR COMPLIANCE

The Contractor shall use this basic SWPPP that includes both narrative and drawings (Storm Water Control Plans). The detailed SWPPP shall state the following as a minimum: (1) the project start and completion dates, (2) bid options to be executed with the project, (3) sequence of construction activities and pollution control measures, (4) discussion of the Best Management Practices (BMP) and implementation of BMP during project execution, (5) identify the list of materials brought on-site including the MSDS, (6) runoff computation of each drainage area (see paragraph 4.1), and (7) identify the type of storm control structures on the revised storm water control plans.

Being responsible for the daily operations at the construction site, the Contractor shall submit the detailed SWPPP (including the revised storm water control plans), and a Notice of Intent (NOI) for the storm water discharges associated with Industrial Activity under NPDES General Permit to EPA Region 6 in Dallas, Texas. The NOI (EPA form 3510-6) shall be submitted no later than 48 hours before start of construction. A separate NOI is required for each construction contract or each phase of the construction activities. The mailing address for NOI submittal is:

Stormwater Notice of Intent (4203)
USEPA, 401 M Street, SW
Washington, D. C. 20460

The Contractor's detailed SWPPP (including the revised storm water control plans) a copy of submitted NOI shall be provided to the Contracting Officer before start of construction. A copy of the U.S. Army Corps of Engineers NOI (obtained from the Contracting Officer), the Contractor's NOI, and a brief project description shall be posted on the project bulletin board. The Contractor's detailed SWPPP shall be kept on-site at all times. During construction, the Contractor shall perform work as required per paragraph, MAINTENANCE AND INSPECTION PROCEDURES in this section.

No later that 10 working days after final stabilization, the Contractor shall submit the Notice of Termination (NOT), EPA Form 3510-7 to both the EPA and the U.S. Army Corps of Engineers. Submission to the Corps of Engineers shall be made to the following address:

Department of the Army
U.S. Army Corps of Engineers
CESWF-EV-EE
ATTN: Dr. Hank Jarboe
P.O. Box 17300
Fort Worth, Texas 76102-0300

Two copies of the submitted NOT shall be provided to the Contracting Officer's project file. EPA Forms are available on web site at http://www.epa.gov/earth1r6/6en/w/forms.htm

PART 12 ATTACHMENTS

12.1 OWNER CERTIFICATION

OWNER CERTIFICATION
FOR
DEPLOYMENT READY REACTION FIELD AND TANK TRAILS
FORT HOOD, TEXAS

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

MICHAEL J. MOCEK, P.E.
DEPUTY DISTRICT ENGINEER

Date Certified:_____

Attachments:

Sheet #	Description
C-001	PROJECT LOCATION MAP
C-181	STORM WATER POLLUTION PREVENTION PLAN
C-182	STORM WATER POLLUTION PREVENTION PLAN
C-183	STORM WATER POLLUTION PREVENTION PLAN
C-184	STORM WATER POLLUTION PREVENTION PLAN
C-185	STORM WATER POLLUTION PREVENTION PLAN
C-186	STORM WATER POLLUTION PREVENTION PLAN
C-187	STORM WATER POLLUTION PREVENTION PLAN
C-188	STORM WATER POLLUTION PREVENTION PLAN
C-189	STORM WATER POLLUTION PREVENTION PLAN
C-190	STORM WATER POLLUTION PREVENTION PLAN
C-191	STORM WATER POLLUTION PREVENTION PLAN
C-192	STORM WATER POLLUTION PREVENTION PLAN
C-193	STORM WATER POLLUTION PREVENTION PLAN
C-194	STORM WATER POLLUTION PREVENTINO PLAN
C-195	STORM WATER POLLUTION PREVENTION PLAN
C-196	STORM WATER POLLUTION PREVENTION PLAN
C-197	STORM WATER POLLUTION PREVENTION PLAN
C-198	STORM WATER POLLUTION PREVENTION PLAN
C-199	STORM WATER POLLUTION PREVENTION PLAN
C-200	DRRF OPTION-STORM WATER POLL. PREVENTION PLAN 1
C-201	DRRF OPTION-STORM WATER POLL. PREVENTION PLAN 2
C-507	STORM WATER POLLUTION PREVENTION PLAN DETAILS

12.2 STORMWATER POLLUTION PREVENTION PLAN

STORMWATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT

INSPECTOR:_____ DATE:_____

INSPECTOR'S
QUALIFICATION:_____

_____

_____

_____

_____

DAYS SINCE LAST RAINFALL:_____ AMOUNT OF LAST RAINFALL:_____INCHES

STABILIZATION MEASURES

_____

AREA	DATE SINCE LAST DISTURBANCE	DATE OF NEXT DISTURBANCE	STABILIZED? (YES/NO?)	STABILIZED WITH	CONDITION

_____

_____

STABILIZATION REQUIRED:

_____

_____

TO BE PERFORMED BY:_____ ON or BEFORE:_____

STORMWATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT

OTHER CONTROLS - STABILIZED CONSTRUCTION ENTRANCE

IS MUCH SEDIMENT TRACKED ONTO THE ROAD?	ARE DUST AND SEDIMENT CONTROL MEASURES WORKING?	DOES ALL TRAFFIC USE THE STABILIZED ENTRANCE TO THE SITE?	ARE ASSOCIATED DRAINAGE STRUCTURES WORKING?

MAINTENANCE REQUIRED FOR CONSTRUCTION ENTRANCE:

TO PERFORMED BY:_____ ON OR BEFORE:_____

OTHER CONTROLS - DEVELOP SITE SPECIFIC TABLES AS NEEDED

FOR ALL STABILIZATION MEASURES, STRUCTURAL, AND NON-STRUCTURAL CONTROLS

CHANGES/CORRECTIONS REQUIRED IN POLLUTION PREVENTION PLAN:

REASONS FOR CHANGES:

INSPECTOR'S SIGNATURE:_____ DATE:_____

MAINTENANCE REQUIRED FOR SEDIMENT BASIN(S):

STORMWATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT

_____
_____
_____

TO BE PERFORMED BY:_____ ON OR BEFORE:_____

STRUCTURAL CONTROLS - SILT FENCE(S)

FROM	TO	IS THE BOTTOM OF THE FABRIC STILL BURIED?	IS THE FABRIC IN GOOD CONDITION?	HOW DEEP IS THE SEDIMENT?

MAINTENANCE REQUIRED FOR THE SILT FENCE (S):

_____
_____
_____
_____
_____

TO BE PERFORMED BY:_____ ON OR BEFORE:_____

STORMWATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT

STRUCTURAL CONTROLS - EARTH DIKES(S)

FROM	TO	IS DIKED STABILIZED?	IS THERE EVIDENCE OF WASH-OUT OR OVERTOPPING?

MAINTENANCE REQUIRED FOR THE EARTH DIKE(S):

_____
_____
_____
_____
_____

TO BE PERFORMED BY:_____ ON OR BEFORE:_____

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS

CEGS-02241 (April 1992)

Superseding
CEGS-02241 (February 1989)
TYPED 30 Sep 97

SECTION 02241

AGGREGATE BASE COURSE FOR SHOULDERS, SUBBASE, BASE OR OPEN SURFACES
AMENDMENT NO. 0002

PART 1 PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS(ASTM)

ASTM C 29	(1991a) Unit Weight and Voids in Aggregate
ASTM C 127	(1988; R 1993) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1993) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 422(1963; R 1990)	Particle-Size Analysis of Soils
ASTM D 1556(1990)	Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557(1991)	Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-1bf/cu. ft. (2,700 kN-m/cu. m.))

ASTM D 2167(1994)	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT)

1.2 MEASUREMENT AND PAYMENT

All work is incidental to the contract and no separate measurement and payment will be made.

1.2.1 DELETED
1.2.2 DELETED

1.3 DEFINITIONS
1.3.1 Aggregate Base

Aggregate base as used herein is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.3.2 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated hereinafter as percent laboratory maximum density.

1.4 GENERAL

The work specified herein consists of the construction of an aggregate base course. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes and typical sections shown in the plans. Sources of all materials shall be selected well in advance of the time that materials will be required in the work.

1.5 SUBMITTALS

Indicate submittal classification in the blank space using "GA" when the

submittal requires Government approval or "FIO" when the submittal is for information only. Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Plant, Equipment, Machines, and Tools; FIO.

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-09 Reports

Sampling and Testing; FIO.

Field Density; FIO.

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

SD-18 Records

Waybills and Delivery Tickets; FIO.

Coarse Aggregate; FIO.

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and delivery tickets for all materials actually used. A notification stating which type of coarse aggregate is to be used.

1.6 WEATHER LIMITATIONS

Base shall not be constructed when the atmospheric temperature is less than 2 degrees C. Base shall not be constructed on subgrades that are frozen or contain frost. If the temperature falls below 2 degrees C,completed areas shall be protected against any detrimental effects of freezing.

1.7 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.7.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in satisfactory working condition at all times. Other compacting equipment may be used in lieu of that specified, where it can be demonstrated that the results are equivalent. The

equipment shall be adequate and have the capability of producing the results specified.

1.7.2 Steel-Wheeled Rollers

Steel-wheeled rollers shall be the self-propelled type weighing not less than 9 metric tons,with a minimum weight of 135 kilograms per millimeter width of rear wheel. Wheels of the rollers shall be equipped with adjustable scrapers. The use of vibratory rollers is optional.

1.7.3 Pneumatic-Tired Rollers

Pneumatic-tired rollers shall have four or more tires, each loaded to a minimum of 13,600 kilograms and inflated to a minimum pressure of 1035 kPa. The loading shall be equally distributed to all wheels, and the tires shall be uniformly inflated. Towing equipment shall also be pneumatic-tired.

1.7.4 Mechanical Spreader

Mechanical spreader shall be self-propelled or attached to a propelling unit capable of moving the spreader and material truck. The device shall be steerable and shall have variable speeds forward and reverse. The spreader and propelling unit shall be carried on tracks, rubber tires, or drum-type steel rollers that will not disturb the underlying material. The spreader shall contain a hopper, an adjustable screed, and outboard bumper rolls and be designed to have a uniform, steady flow of material from the hopper. The spreader shall be capable of laying material without segregation across the full width of the lane to a uniform thickness and to a uniform loose density so that when compacted, the layer or layers shall conform to thickness and grade requirements indicated. The Contracting Officer may require a demonstration of the spreader prior to approving use in performance of the work.

1.7.5 Sprinkling Equipment

Sprinkling equipment shall consist of tank trucks, pressure distributors, or other approved equipment designed to apply controlled quantities of water uniformly over variable widths of surface.

1.7.6 Tampers

Tampers shall be of an approved mechanical type, operated by either pneumatic pressure or internal combustion, and shall have sufficient weight and striking power to produce the compaction required.

1.7.7 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 3.05 meter straightedge for each bituminous paver, for use in the testing of the finished surface. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to ensure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

1.8 STOCKPILING MATERIALS

Materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at locations designated. Before stockpiling of material, storage sites shall be cleared, and sloped to drain. Materials obtained from different sources shall be stockpiled separately.

1.9 SAMPLING AND TESTING

1.9.1 General Requirements

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. No work requiring testing shall be permitted until the facilities have been inspected and approved. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the facilities to pass the first inspection will be charged to the Contractor. Tests shall be performed in sufficient numbers and at the locations and times directed to insure that materials and compaction meet specified requirements. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of tests.

1.9.2 Test Results

Results shall verify that materials comply with this specification. When a material source is changed, the new material will be tested for compliance. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced or modified as directed by the Contracting Officer.

1.9.3 Sampling

Aggregate samples for laboratory tests shall be taken in accordance with ASTM D 75.

1.9.4 Sieve Analysis

Before starting work, at least one sample of material shall be tested in accordance with ASTM C 136 and ASTM D 422 on sieves conforming to ASTM E 11. After the initial test, a minimum of one analysis shall be performed for each 1000 metric tons of material placed, with a minimum of three analyses for each day's run until the course is completed.

1.9.5 Liquid Limit and Plasticity Index

One liquid limit and plasticity index shall be performed for each sieve analysis. Liquid limit and plasticity index shall be in accordance with ASTM D 4318.

1.9.6 Laboratory Density

Tests shall provide a moisture-density relationship for the aggregate. Tests shall be conducted in accordance with ASTM D 1557.

1.9.7 Weight Per Cubic Meter of Slag

Weight per cubic meter of slag shall be determined in accordance with ASTM C 29.

1.9.8 Wear Tests

Wear tests shall be performed in accordance with ASTM C 131. One test shall be run per 1000 square meter of completed base course. A minimum of one test per aggregate source shall be run.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Aggregates

Aggregates shall consist of crushed stone or slag, crushed gravel, angular sand, or other approved material. Aggregates shall be durable and sound, free from lumps of clay, organic matter, objectionable coatings, and other foreign material. Material retained on a 4.75 mm sieve shall be known as coarse aggregate and that passing the 4.75 mm sieve shall be known as binder material.

2.1.1.1 Coarse Aggregate

Only one type of coarse aggregate shall be used on the project. Coarse aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3, and an elongated particle is one having a ratio of length to width greater than 3.

a. Crushed Gravel: Crushed gravel shall be manufactured from gravel particles 50 percent of which by weight are retained on the maximum size gradation sieve specified.

b. Crushed Stone: Crushed stone retained on each sieve specified shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are adjacent, the angle between the planes of the fractures must be at least 30 degrees to count as two fractured faces.

2.1.1.2 Slag

Slag shall be an air-cooled blast-furnace product having a dry unit weight of not less than 1045 kg/cubic meter.

2.1.2 Binder Material

Binder material shall consist of screenings, angular sand, or other finely divided mineral matterprocessed or naturally combined with the coarse aggregate. Liquid-limit and plasticity-index requirements shall apply to any component that is blended to meet the required gradation and shall also apply to the completed course. The portion of any component or of the completed course passing the 0.425 mm sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.1.3 Gradation

Requirements for gradation specified shall apply to the completed base course. The aggregates shall have a 45 millimeter maximum size and shall be continuously graded within the following limits:

Sieve Designation	Percentage by Weight Passing Square-mesh Sieve*
44 mm	100
22 mm	65 - 90
9.5 mm	50 - 70
4.75 mm	35 - 55
0.425 mm	15 - 30

* The table is based on aggregates of uniform specific gravity and the percentages passing the various sieves are subject to appropriate corrections in accordance with ASTM C 127 and C 128 when aggregates of "varying specific gravity are used. The gradation above conforms to Texas Department of Transportation Standard Specification for base course, Item 247, Type A, Grade 1.

(a) Particles having diameters less than 0.02 millimeter shall not be in excess of 3 percent by weight of the total sample tested.

(b) The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves are subject to appropriate correction in accordance with ASTM C 127 and ASTM C 128 when aggregates of varying specific gravities are used.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

When the base is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF AGGREGATE SOURCES

Aggregates shall be obtained from off-site sources.

3.3 PREPARATION OF UNDERLYING COURSE

3.3.1 General Requirements

Before constructing aggregate base course, the previously constructed underlying course shall be cleaned of foreign substances. Surface of underlying course shall meet the specified compaction and surface tolerances. Subgrade shall conform to Section 02300 EARTHWORK Ruts or soft, yielding spots that may appear in the underlying course, areas having inadequate compaction, and deviations of the surface from requirements specified shall be corrected. For cohesionless underlying materials containing sands, sand gravels, or any other cohesionless material in harmful quantities, the surface shall be mechanically stabilized with aggregate prior to placement of the aggregate course. Stabilization may be accomplished by mixing base course material into the underlying course and compacting by approved methods. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until base course is placed.

3.3.2 Grade Control

Underlying material shall be excavated to sufficient depth for the required base course thickness so that the finished base course with the subsequent surface course will meet the fixed grade. Finished and completed area shall conform to the lines, grades, cross section, and dimensions indicated.

3.4 INSTALLATION

3.4.1 Mixing and Placing

Materials shall be mixed by the stationary plant, traveling plant, or road mix method and placed in such a manner as to obtain uniformity of the aggregate base course material and at a uniform optimum water content for compaction. The Contractor shall make such adjustments in mixing or placing procedures or in equipment to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to ensure a satisfactory base course.

3.4.2 Edges of Base Course

Approved material shall be placed along edges of aggregate base course in such quantities as will compact to thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 300 mm width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of base course.

3.4.3 Compaction

Each layer of aggregate base course including shoulders shall be compacted. Water content shall be maintained at optimum. Density of compacted mixture shall be at least 95 percent , as shown on plans, of laboratory maximum density. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. Areas inaccessible to the rollers shall be compacted with mechanical tampers, and shall be shaped and finished by hand methods.

3.4.4 Layer Thickness

Compacted thickness of the aggregate course shall be as indicated. No layer shall be in excess of 200 mm nor less than 150 mm in compacted thickness.

3.4.5 Proof Rolling

When aggregate base course is used in medium-load airfield runway pavement construction, this paragraph will be retained; when used otherwise, references to proof rolling will be deleted unless it is specifically required by the design engineer.

Proof rolling of the areas indicated shall be in addition to the compaction specified and shall consist of the application of 30 coverages with a heavy pneumatic-tired roller having four or more tires, each loaded to a minimum of 13,600 kg and inflated to a minimum of 1035 kPa. In areas designated, proof rolling shall be applied to the top lift or layer on which base course is laid and to each layer of base course. Water content of the top lift or layer on which base course is laid shall be maintained at optimum or at percentage directed from start of compaction to completion of proof rolling of that layer. Water content of each layer of the base course

shall be maintained at the optimum percentage directed from start of compaction to completion of proof rolling. Materials in base course or underlying materials that produce unsatisfactory results by rolling shall be removed and replaced with satisfactory materials and recompacted.

3.4.6 Finishing

The surface of the top layer shall be finished to grade and cross section shown. Finished surface shall be of uniform texture. Light blading during compaction may be necessary for the finished surface to conform to the lines, grades, and cross sections. Should the surface for any reason become rough, corrugated, uneven in texture, or traffic marked prior to completion, such unsatisfactory portion shall be scarified, reworked, recompacted, or replaced as directed.

3.4.6.1 Smoothness

Surface of each layer shall show no deviations in excess of 9.5 mm when tested with the 3.05 meter straightedge. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting, as directed.

3.4.6.2 Thickness Control

Compacted thickness of the base course shall be within 12.7 mm of the thickness indicated. Where the measured thickness is more than 12.7 mm deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 12.7 mm thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 7 mm of the thickness indicated.

3.5 FIELD QUALITY CONTROL

3.5.1 Field Density

Field in-place density shall be determined in accordance with ASTM D 1556 ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil, and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 at least once per lift for each 2000 square meter of base material. Calibration curves and calibration test results shall be furnished within 24 hours of the conclusion of the tests. At least one field density test shall be performed for each 500 square meters of each layer of base material.

3.5.2 Smoothness

Measurements for deviation from grade and cross section shown shall be taken in successive positions parallel to the road centerline with a 3 meter straightedge. Measurements shall also be taken perpendicular to the road centerline at 15 meter intervals.

3.5.3 Thickness

Thickness of the base course shall be measured at intervals in such a manner as to ensure one measurement for each 1000 square meters of base course. Measurements shall be made in 75 mm diameter test holes penetrating the base course.

3.6 TRAFFIC

Completed portions of the area may be opened to traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.

3.7 MAINTENANCE

The aggregate base course shall be maintained in a satisfactory condition until accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Removed in-place materials that are unsuitable for the base course material that is removed for the required correction of defective areas, and waste material and debris shall be disposed of as directed.

SECTION 02565

EMULSIFIED ASPHALT BASE TREATMENT
AMENDMENT NO.0002

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 140	(1993) Sampling Bituminous Materials
ASTM D 977	(1991) Emulsified Asphalt
ASTM D 979	(1989) Sampling Bituminous Paving Mixtures
ASTM D 1250	(1980; R 1990) Petroleum Measurement Tables
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 6307	(1998) Asphalt Content of Hot-Mix Asphalt by Ignition Method

TEXAS DEPARTMENT OF TRANSPORTATION

Standard Specifications for Construction of Highways, Streets and Bridges, 1993

Manual of Testing Procedures (1983; R 1993)

U.S. ARMY CORPS OF ENGINEERS HANDBOOK FOR CONCRETE AND CEMENT (COE)

CRD-C 649	(1995) Standard Test Method for Unit Weight, Marshall Stability, and Flow of Bituminous Mixtures
CRD-C 650	(1995) Standard Test Method for Density and Percent Voids in Compacted Bituminous Paving Mixtures

1.2 UNIT PRICES

1.2.1 WAYBILLS AND DELIVERY TICKETS

Copies of waybills or delivery tickets shall be submitted during the progress of the work. Before the final payment is allowed, waybills and certified delivery tickets shall be furnished for all bituminous materials used in the construction.

1.2.2 MEASUREMENT FOR PAYMENT

1.2.2.1 Emulsified Asphalt

Emulsified asphalt will be measured in the number of liters of the material used in the accepted work, corrected to liters at 15 degrees C in accordance with ASTM D 1250. A coefficient of 0.00025 per degree C shall be used for asphalt emulsion.

1.2.3 BASIS FOR PAYMENT

The quantities of emulsified asphalt will be paid for at the respective contract unit price. No payment will be made for any material wasted, used for the convenience of the Contractor, unused or rejected, or for water used. Payment for constructing the emulsified asphalt stabilized layer will be made at the applicable contract unit price per liter of emulsion per square meter of area . This payment shall constitute full compensation for all plant, labor, materials, and all costs necessary for placement, manipulation, compaction, and curing of the completed stabilized surface course.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Plant, Equipment, Machines, and Tools; FIO.

Mix Design; GA.

List of proposed equipment to be used in performance of construction work, including descriptive data. Mix design at least 30 days before it is to be used.

SD-08 Statements

Source of Bituminous Material; FIO.

Notification upon selection of emulsified asphalt.

Product Data and Certificate of Compliance from Emulsified Asphalt Manufactrer

SD-09 Reports

Sampling and Testing; FIO.

Calibration curves and related test results, prior to using the device or equipment being calibrated. Copies of field tests results within 24 hours after the tests are performed. Certified copies of test results, not less than 30 days before material is required for the work.

SD-14 Samples

Emulsified Asphalt; FIO.

Emulsified Asphalt used in the job.

SD-18 Records

Waybills and delivery tickets; GA.

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and
delivery tickets for all materials actually used.

1.4 DEGREE OF COMPACTION

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure in accordance with ASTM D 1557, abbreviated herein as percent laboratory maximum density. Moisture-density relationships shall be performed on each type of aggregate base course material proposed prior to the addition of emulsion.

1.5 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.5.1 GENERAL REQUIREMENTS

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control and smoothness requirements as set forth herein.

1.5.2 BITUMINOUS DISTRIBUTOR

Bituminous Ddistributor shall have pneumatic tires of such size and number to prevent rutting, shoving, or otherwise damaging base surface or other layers in the pavement structure. Distributor shall be designed and equipped to spray bituminous material in a uniform double or triple lap at the specified temperature, at variable widths, and at readily determined and controlled rates from 0.15 to 6.5 liters per square meter with an allowable variation from the specified rate of plus or minus 5 percent and with a pressure range of 175 to 515 kPa. Distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. Distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

1.5.3 TRAVELING-PLANT MIXER

Traveling-plant mixer shall be self-propelled or tractor-drawn, an shall be capable of maintaining a uniform rate of travel. The plant shall be mounted on wheels or tread equipment of such type as will not overload or damage the subgrade or base course when the mixer is loaded to capacity. The device for picking up aggregates from windrows shall be such as will pick up only the windrowed aggregate, leaving the base clean. The pick-up and elevator shall be entirely enclosed for proportioning the fine and filler aggregate. The equipment for proportioning the filler shall be equipped with devices for accurately proportioning the filler added to the mixture. The plant shall be capable of depositing the processed mixture on the base course.

1.5.4 BLADE GRADERS

Blade graders for windrwoing aggregate, for mixing, and for spending processed material shall be self-powered. Each grader shall have a wheelbase notless than 5.18 m, a blade not less than 3.66 m long, and shall be equipped with pneumatic tires. Blade graders shall be adequately powered inorder to perform thework properly and shall weigh at least 7 metric tons.

1.5.5 POWER ROLLERS

Power rollers shall be steel-wheel or pneumatic-tired types conforming to

the following requirements:

1.5.5.1 STEEL-WHEEL

Steel-wheel rollers shall be either tandem or three-wheel type weighing not less than 4.5 metric tons, and equipped with adjustable scrapers. The rollers which may be static or vibratory shall be equipped with watertanks an sprinkling apparatus that shall be used when necessary to keep the wheels wet to prevent adherence ofthe bituminous material to the wheels.

1.5.5.2 PNEUMATIC-TIRED

Pneumatic-tired rollers shall be self-propelled and equipped with not less than 9 wheels mounted on 2 axles in such a manner that the rear tires will not following the tracks ofthe forward group. The pneumatic-tired rollers shall also be equipped with suitable beams or platform for ballast loading and shall be loaded to provide required compaction. The tires shall be uniformly inflated tonotless than 310 kPa.

1.5.6 MECHANICAL SPREADERS

The equipment for spreading, shaping, and finishign shall consist of approved self-contained power machines capable of taking the bituminous mixture directly fromt eh discharge end of traveling plant and spreading the mixture at required application rate.

1.5.7 TRACTORS

Tractors shall be of the crawler type and shall be equipped with street plates or flat treads.

1.5.8 Miscellaneous Equipment

Disk, spike-tooth, or spring-tooth harrows, multiple-blade or retread mixers, small tools, and other equipment shall be the required types.

1.5.9 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 3.05-meter straightedge for each bituminous paver, for use in the testing of the finished surface. Straightedge shall be made available for government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

1.6 WEATHER LIMITATIONS

Emulsified asphalt shall not be applied when the atmospheric temperature is less than 10 degrees C. No emulsified asphalt shall be applied to soils that are frozen or contain frost. If the temperature falls below 2 degrees C, completed bitumen-treated areas shall be protected against any detrimental effects of freezing.

1.7 SOURCE OF BITUMINOUS MATERIAL

After selecting the source of bituminous material a notification shall be submitted to the Contracting Officer within 15 days after the award of contract.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 EMULSFIED ASPHALT

Material used for in the soil-bitumen mixture shall be the same type throughout and shall conform to the following to ASTM D 977, Type SS-1.

2.1.2 MATERIAL TO BE STABILIZED

Material to be stabilized shall consist of aggregate base course meeting the requirements of Section 02241 AGGREGATE BASE COURSE.

2.1.3 WATER

Water shall be clean, fresh, and potable.

PART 3 - EXECUTION

3.1 TEST SECTION
3.1.1 General

A test section shall be constructed to evaluate the mixing, placement, and compaction procedures required to construct the stabilized material. Test section data will be used by the Contracting Officer to determine the quantity of emulsified asphalt to use in the stabilization process, and suitability of equipment to produce the desired product.

3.1.2 Scheduling

The test section shall be constructed a minimum of 30 days prior to the start of full scale production to provide sufficient time for an evaluation of the proposed materials, equipment, and procedures.

3.1.3 Location and Size

The test section shall be placed in the production paving limits in an area representative of the subgrade conditions and as approved by the Contracting Officer. The underlying courses and subgrade preparation required for the pavement section shall be completed, inspected, and approved in the test section prior to constructing the emulsified surface treatment. The test section shall be a minimum of 135 meters long and one full paving lane wide. The test section shall be constructed in three (3)

45-meter long sections as follows:

Section	Quantity of SS-1, liters/m^2/
1	2.26
2	4.52
3	9.05

3.1.4 Initial Testing

Certified test results, to verify that the materials proposed for use in the test section meet the contract requirements, shall be provided by the Contractor and approved by the Contracting Officer prior to the start of the test section.

3.1.5 Mixing, Placement and Compaction

Mixing, placement, and compaction shall be accomplished using the equipment meeting the requirements of paragraph PLANT, EQUIPMENT, MACHINES, AND TOOLS.

3.1.6 Evaluation

Within 10 days of completion of each 45-meter test section component, the Contractor shall submit to the Contracting Officer a Test Section Report complete with all required test data. The Contracting Officer will evaluate the data and provide to the Contractor the amount of emulsified asphalt to use in the stabilization process. The test data required in the report for each 45-meter test section component shall consist of the following:

a. Sieve Analysis per ASTM D 136 and ASTM D 422 of aggregate Base prior to the addition of emulsion.

b. Liquid and Plasticity Index per ASTM D 4318 of aggregate Base prior to the addition of emulsion.

c. Moisture-Density relationship per ASTM D 1557 of aggregate Base prior to the addition of emulsion and after the addition of emulsion.

d. Field Density Tests of the finished course per ASTM D 1556 and ASTM D 2922.

e. Slow Strength, asphalt content, and mix density of stabilized material when tested in accordance with Test Method TEX-126-E (minimum two specimens).

f. Marshall stability tests (50 blow method) per CRD-C 649 and CRD-C 650 for laboratory specimens from each 45-meter test section and a minimum of 2 field cores from different location taken from within each 45-meter test section. Tests shall include stability, flow, specific gravity of coarse and fine aggregates, percent voids

in the total mix, percent voids filled with bitumen, density, and percent asphalt for both laboratory and field cored samples. Cores are to be taken a minimum of 7 days after final compaction. A coring method that will insure intact specimens for required testing shall be implemented. Loose field samples shall be collected using the procedures presented in ASTM D 75. Asphalt extraction of the finished course shall be performed in accordance with ASTM D 6307.

g. Aggregate absorption per ASTM C 127 and ASTM C 128 from the laboratory Marshall Stability sample.

3.2 GENERAL CONSTRUCTION REQUIREMENTS

3.2.1 Mix Design

The emulsified asphalt shall be mixed and blended with the aggregate base at the rate of 4.52 liters of emulsified asphalt per square meter with a tolerance of plus or minus 1.25 liters per square meter, per 50 millimeter lift of aggregate base regardless of the amount of water added. The percentage of emulsified asphalt in the mixture shall be regulated to insure that the specified amount of emulsified asphalt is incorporated into the material, while maintaining the proper moisture content. The required test section shall be used to validate the above rate for production.

3.2.2 Bituminous Material Mix

Emulsified asphalt, of the amount required for each application, shall be uniformly applied by a bituminous distributor within a temperature range of 25 to 55 degrees C, as directed. Areas inaccessible to or missed by the distributor shall be properly treated with Emulsified asphalt, using the manually operated hose attachment. After mixing is completed, the proportions of the mixture shall be in accordance with the approved mix design. On the basis of dry weight, moisture shall be 5 percent plus or minus 1 percent when mixing is complete. When the stabilized course is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire construction period to prevent water from collecting or standing on the area to be stabilized or on pulverized, mixed, or partially mixed material.

3.3 PREPARATION OF AREAS TO BE STABILIZED

3.3.1 General Requirements

Area shall be cleaned of debris. Area will be inspected for adequate compaction and shall be capable of withstanding, without displacement, at least 100 percent of laboratory maximum density for the soil-bitumen mixture. Debris and removed unsatisfactory in-place material shall be disposed of off site.

3.3.2 IN-PLACE MATERIALS TO RECEIVE STABILIZED COURSE

Soft, yielding areas and ruts or other irregularities in the surface shall be corrected. Material in the affected areas shall be loosened and unsatisfactory material removed. Approved aggregate base course material shall be added where directed. The area shall then be shaped to line, grade, and cross section, and shall be compacted to at least 100 percent of laboratory maximum density.

3.3.3 AGGREGATE BASE COURSE MATERIAL

Sufficient aggregate base course material shall be utilized to provide the required thickness of the soil-bitumen layer after compaction and shall be processed to meet the requirements specified before emulsified asphalt treatment process is undertaken.

3.4 GRADE CONTROL

.The contractor shall provide a sufficient amount of aggregate base course material so that the thickness of the compacted stabilized material meets the fixed grade. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be placed in lines parallel to the centerline of the area under construction and suitably spaced for string lining. Finished and completed stabilized area shall conform to lines, cross section and dimensions indicated.

3.5 MIXING OF MATERIALS

3.5.1 MIXED-IN-PLACE METHOD

3.5.1.1 PREPARATION OF UNDERLYING COURSE

Before constructing the stablized course, the previously constructed underlying course shall be cleaned of foreign substances. Surface of underlying course shall meet the specified compaction and surface tolerances. Aggregate base course shall conform to Section 02241 AGGREGATE BASE COURSE. Ruts or soft, yielding spots that may appear in the underlying course, areas having inadequate compaction, and deviations of the surface from reequirements specified shall be corrected. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the stabilized course is placed.

3.5.1.2 APPLICATION OF WATER

Scarified material shall be shaped to the cross section and grade indicated. Moisture content will then be determined. Water shall be added in increments and each increment of water shall be partially incorporated in the mix to avoid concentration of water near the surface. After the last increment of water has been added, mixing shall be continued until the water is uniformly distributed throughout the mixture. Particular care shall be taken to ensure satisfactory moisture distribution along the edges

of the section.

3.5.1.3 APPLICATION OF EMULSIFIED ASPHALT

Rate of application of emulsfied asphalt for the soil-bitumen mixture shall be as specified. Emulsified asphalt shall be uniformly mixed with the soil by means of a blade grader or rotary mixer. If the bituminous material is applied in more than one increment, each application shall be partially mixed into the material as directed. After the required amount of bituminous material has been added to the loose material, the bituminous material and soil shall be thoroughly mixed by blading with a blade grader, rotary mixer, or other equipment suitable for mixing the soil and bitumen. No equipment except that used for spreading and mixing operations shall pass over the freshly spread bituminous material.

3.5.2 TRAVELING-PLANT METHOD

The aggregate base course material shall be placed in windrows. The windrows shall be of sufficient size to cover a predetermined width to the indicated compacted thickness. Traveling plant shall move at a uniform rate of speed and shall accomplish thorough mixing of the materials. Water and bituminous materialThe emulsified apshalt shall be delivered separately or together at a predetermined rate. The soil-bitumen shall have been allowed an adequate amount of time to cure. After curing, the mixture shall be shaped approximately to the specified lines and grades and thoroughly loosened to its full depth and width. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. The speed of the roller shall be such that displacement of materials does not occur. Density of compacted mixture shall be at least 100 percent of laboratory maximum density. Areas inaccessible to rollers shall be compacted to the required density with mechanical tampers.

3.6 FINISHING

The surface of the top layer shall be finished to grade and cross section shown. Finished surface shall be uniform texture. Light blading during rolling may be necessary for the finished surface to conform to the lines, grades, and cross sections. Should the surface for any reason become rough, corrugated, uneven in texture, or traffic-marked prior to completion, such unsatisfactory portion shall be scarified, reworked, relaid, or replaced as directed. Should any portion of the course, when laid, become watersoaked for any reason, that portion shall be removed immediately, and the mix placed in a windrow and aerated until a moisture content within the limits specified is obtained, and then spread, shaped, and rolled as specified. Any material used in this manner must meet the specification requirements, including design asphalt content for the specified application rate. Additional testing will be required for these areas for tests specified in paragraph 3.9 SAMPLING AND TESTING.

3.6.1 SMOOTHNESS

The surface of each layer shall show no deviations in excess of 9.5 mm for service roads and 15.0 mm for the tank trailswhen tested with the 3.05-meter straightedge. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting, as directed.

3.6.2 THICKNESS CONTROL

Compacted thickness of the stabilized course shall be within 12.7 mm of the thickness indicated. Where measured thickness of the stabilized course is more than 12.7 mm deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness of the stabilized course is more than 12.7 mm thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within the thickness indicated.

3.7 CONSTRUCTION JOINTS

At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face free of loose or shattered material. Material along construction joints not properly compacted shall be removed and replaced with soil-bitumen that is mixed, moistened, and compacted in accordance with this specification.

3.8 SAMPLING AND TESTING

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor at no additional cost to the Government. No work requiring testing will be permitted until the facilities have been inspected and approved. Tests shall be performed in sufficient numbers and at the locations and times directed to ensure that materials and compaction meet specified requirements. Certified copies of test results shall be furnished to the Contracting Officer.

3.8.1 FIELD DENSITY

Field in-place density shall be determined in accordance with ASTM D 1556 and ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both density and moisture gauges shall be made at the beginning of a job on each different type of material and at intervals as directed by the Contracting Officer. The following number of tests shall be the minimum acceptable for each lift of stabilized material. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 at least once per lift for each 5000 square meters of stabilized material. Calibration curves and calibration test results shall be furnished within 24 hours of conclusion

of the tests. At least one field density test shall be performed for each 700 square meters of each layer of stabilized material.

3.8.2 SIEVE ANALYSIS

Before starting work, at least one sample of material shall be testing in accordance with ASTM D 136 and ASTM D 422 on sieves conforming to ASTM E 11. After the initial test, a minimum of one analysis shall be performed for each 1000 metric tons of in place material to be stabilized, with a minimum of three analyses for each day's run until the course is completed. When the source of materials is changed and deficiencies are found, the analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced at no additional cost to the Government.

3.8.3 LIQUID LIMIT AND PLASTICITY INDEX

One liquid limit and plasticity index shall be performed for each sieve analysis. Liquid limit and plasticity index shall be in accordance with ASTM D 4318.

3.8.4 EXTRACTION TEST

Extraction tests shall be conducted in accordance with ASTM D 2172, to confirm the amount of bitumen and moisture in the mixture. One test shall be conducted for every 275 metric tons. Sampling shall be taken in accordance with ASTM D 979.

3.8.5 SMOOTHNESS TEST

Measurements for deviation from grade and cross section shown shall be taken in successive positions parallel to the road centerline, with a 3.05-meter straightedge. Measurements shall also be taken perpendicular to the road centerline at 150-meter intervals.

3.8.6 THICKNESS

Thickness of the stabilized course shall be measured at intervals in such a manner as to ensure one measurement for each 2500 square meters of stabilized course. Measurements shall be made in 75 mm diameter test holes penetrating the stabilized course.

3.9 MAINTENANCE

Stabilized area shall be maintained in a satisfactory condition until accepted by the Contracting Officer. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Defects shall be corrected as specified herein.

3.10 TRAFFIC

Completed portions of the soil-bitumen area may be opened to controlled traffic within 4 hours of completion of the course, if approved by the Contracting Officer.

SECTION 02754
CONCRETE PAVEMENTS
AMENDMENT NO.0002

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 301	(1996) Standard Specification for Structural Concrete
ACI 305R	(1991) Hot Weather Concreting

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 184/A 184M	(1996) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 31/C 31M	(1996) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1997) Concrete Aggregates
ASTM C 39	(1996) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 94	(1997) Ready-Mixed Concrete
ASTM C 123	(1996) Lightweight Pieces in Aggregate
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1997) Portland Cement
ASTM C 192/C 192M	(1995) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997) Air Content of Freshly Mixed

	Concrete by the Pressure Method
ASTM C 260	(1995) Air-Entraining Admixtures for Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 595	(1998) Blended Hydraulic Cements
ASTM C 618	(1997) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 666	(1992) Resistance of Concrete to Rapid Freezing and Thawing
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 989	(1997) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C 1077	(1997) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

ARMY CORPS OF ENGINEERS (COE)

COE CRD-C 130	(1989) Scratch Hardness of Coarse Aggregate Particles
COE CRD-C 300	(1990) Specifications for Membrane-Forming Compounds for Curing Concrete
COE CRD-C 540	(1971; R 1981) Standard Specification for Nonbituminous Inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sawable Type
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100 (1996) Concrete Plant Standards

1.2 SYSTEM DESCRIPTION

This section is intended to stand alone for construction of concrete (rigid) pavement. However, where the construction covered herein interfaces with other sections, the construction at each interface shall conform to the requirements of both this section and the other section, including tolerances for both.

1.3 MEASUREMENT AND PAYMENT

All work is incidental to the contract and no separate measurement and payment will be made.

1.3.1 DELETED

1.3.2 DELETED

1.4 ACCEPTABILITY OF WORK

The pavement will be accepted on the basis of tests made by the Government and by the Contractor or its suppliers, as specified herein. The Government may, at its discretion, make check tests to validate the results of the Contractor's testing. Concrete samples shall be taken by the Contractor at the placement to determine the slump, air content, and strength of the concrete. Test cylinders shall be made for determining conformance with the strength requirements of these specifications and, when required, for determining the time at which pavements may be placed into service. All air content measurements shall be determined in accordance with ASTM C 231. All slump tests shall be made in accordance with ASTM C 143. All test cylinders shall be 150 by 300 mm cylinders and shall be fabricated in accordance with ASTM C 192/C 192M, using only steel molds, cured in accordance with ASTM C 31/C 31M, and tested in accordance with ASTM C 39. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. The Contractor shall furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory.

1.4.1 Evaluation Sampling

Sampling, testing, and mixture proportioning shall be performed by a commercial Testing Laboratory, conforming with ASTM C 1077. The individuals who sample and test concrete and concrete constituents shall be certified as American Concrete Institute (ACI) Concrete Field Testing Technicians, Grade I. The individuals who perform the inspection of concrete shall be certified as ACI Concrete Construction Inspector, Level II. All mix design, weekly quality control reports, smoothness reports, and project certification reports shall be signed by a Registered Engineer.

1.4.2 Surface Testing

Surface testing for surface smoothness and plan grade shall be performed as indicated below by the Testing Laboratory. The measurements shall be properly referenced in accordance with paving lane identification and stationing, and a report given to the Government within 24 hours after measurement is made. A final report of surface testing, signed by a Registered Engineer, containing all surface measurements and a description of all actions taken to correct deficiencies, shall be provided to the Government upon conclusion of surface testing.

1.4.2.1 Surface Smoothness Requirements

The finished surfaces of the pavements shall have no abrupt change of 3 mm or more, and all pavements shall be within the tolerances specified in Table 1 when checked with the straightedge.

TABLE 1
STRAIGHTEDGE SURFACE SMOOTHNESS--PAVEMENTS

Pavement Category	Direction of Testing	Tolerances mm
All Concrete Pavement	Longitudinal	5
	Transverse	6.5

1.4.2.2 Surface Smoothness Testing Method

The surface of the pavement shall be tested with the straightedge to identify all surface irregularities exceeding the tolerances specified above. The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines approximately 4.5 m apart. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length and measuring the maximum gap between the straightedge and the pavement surface, in the area between these two high points.

1.4.3 Edge Slump Testing and Conformance

When slip-form paving is used, not more than 15 percent of the total free edge of the slipformed portion of the pavement, shall have an edge slump exceeding 6 mm and no slab shall have an edge slump exceeding 9 mm. Edge slump shall be determined as above for surface smoothness, at each free edge of each slipformed paving lane constructed. Measurements shall be made at 1.5 to 4.5 m spacings, and as directed. When edge slump exceeding the limits specified above is encountered on either side of the paving lane, additional straightedge measurements shall be made, if required, to define the linear limits of the excessive slump. The concrete for the entire width of the paving lane within these limits of excessive edge slump shall be removed and replaced. Adding concrete or paste to the edge or

otherwise manipulating the plastic concrete after the sliding form has passed, or patching the hardened concrete, shall not be used as a method for correcting excessive edge slump.

1.4.4 Plan Grade Testing and Conformance

The finished surface of the pavements shall conform, within the tolerances shown in Table 1, to the lines, grades, and cross sections shown. The finished surface of new abutting pavements shall coincide at their juncture. The surfaces of other pavements shall vary not more than 18 mm above or below the plan grade line or elevation indicated. Each pavement category shall be checked by the Contractor for conformance with plan grade requirements by running lines of levels at intervals to determine the elevation at each joint intersection.

1.5 PRECONSTRUCTION TESTING OF MATERIALS

The Contractor shall not be entitled to any additional payment or extension of time because of delays caused by sampling and testing additional sources, or samples, necessitated by failure of any samples. Aggregates shall be sampled and tested by the certified Test Laboratory and shall be representative of the materials to be used for the project. Test results, signed by a Registered Engineer, shall be submitted 30 days before commencing paving. No aggregate shall be used unless test results show that it meets all requirements of these specifications, including compliance with ASTM C 33 and deleterious materials limitations.

1.5.1 Flexural Strength

Each lot of pavement will be evaluated for acceptance in accordance with the following procedures. The Contractor shall be responsible for all testing required herein. Testing shall be performed by an approved commercial laboratory. Results of strength tests will not be used for payment adjustments.

1.5.2 Sampling and Testing

One composite sample of concrete from each sublot shall be obtained in accordance with ASTM C 172 from on batch or truckload. Test beams, 152 by 152 mm shall be fabricated and cured in accordance with ASTM C 31/C 31M; and tested in accordance with ASTM C 78. Two test beams per sublot (8 per lot) shall be fabricated and cured and tested as specified in Paragraph; Testing and Inspection for Quality Control.

1.6 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Equipment; FIO.

Manufacturer's literature on the concrete plant; mixing equipment; hauling equipment; placing and finishing, and curing equipment; at least 7 days prior to start of paving.

SD-07 Schedules

Paving; FIO.

Paving Schedules at least 7 days prior to start of paving.

SD-08 Statements

Mixture Proportions; GA.

The report of the Contractor's mixture proportioning studies showing the proportions of all ingredients and supporting information on aggregate and other materials that will be used in the manufacture of concrete, at least 14 days prior to commencing concrete placing operations.

1.7 EQUIPMENT

1.7.1 Batching and Mixing

The batching plant shall conform to NRMCA CPMB 100, the equipment requirements in ASTM C 94, and as specified. Water shall not be weighed or measured cumulatively with another ingredient. All concrete materials batching shall meet ASTM C 94 requirements. Mixers shall be stationary mixers. Batching, mixers, mixing time, permitted reduction of mixing time, and concrete uniformity shall meet the requirements of ASTM C 94, and shall be documented in the initial weekly QC Report.

1.7.2 Transporting Equipment

Transporting equipment shall be in conformance with ASTM C 94 and as specified herein. Concrete shall be transported to the paving site in rear-dump trucks, or in agitators. Bottom-dump trucks shall not be used for delivery of concrete.

1.7.3 Delivery Equipment

When concrete transport equipment cannot operate on the paving lane, side-delivery transport equipment consisting of self-propelled moving conveyors shall be used to deliver concrete from the transport equipment and discharge it in front of the paver. Front-end loaders, dozers, or similar equipment shall not be used to distribute the concrete.

1.7.4 Paver-Finisher

The paver-finisher shall be a heavy-duty, self-propelled machine designed specifically for paving and finishing high quality pavement. The paver-finisher shall weigh at least 3280 kg per m of lane width, and shall be powered by an engine having at least 15000 W per meter of lane width. The paver-finisher shall spread, consolidate, and shape the plastic

concrete to the desired cross section in one pass. The paver-finisher shall be equipped with a full width "knock-down" auger, capable of operating in both directions, which will evenly spread the fresh concrete in front of the screed or extrusion plate. Immersion vibrators shall be gang mounted at the front of the paver on a frame equipped with suitable controls so that all vibrators can be operated at any desired depth within the slab or completely withdrawn from the concrete. The vibrators shall be automatically controlled so that they will be immediately stopped as forward motion of the paver ceases. The spacing of the immersion vibrators across the paving lane shall be as necessary to properly consolidate the concrete, but the clear distance between vibrators shall not exceed 750 mm, and the outside vibrators shall not exceed 300 mm from the edge of the lane. The paver-finisher shall be equipped with a transversely oscillating screed or an extrusion plate to shape, compact, and smooth the surface.

1.7.4.1 Paver-Finisher with Fixed Forms

The paver-finisher shall be equipped with wheels designed to ride the forms, keep it aligned with the forms, and to spread the preventing deformation of the forms.

1.7.4.2 Slipform Paver-Finisher

The slipform paver-finisher shall be automatically controlled and crawler mounted with padded tracks. Horizontal alignment shall be electronically referenced to a taut wire guideline. Vertical alignment shall be electronically referenced on both sides of the paver to a taut wire guideline, to an approved laser control system, or to a ski operating on a completed lane. Control from a slope-adjustment control or control operating from the underlying material shall not be used.

1.7.4.3 Other Types of Finishing Equipment

Clary screeds or other rotating tube floats will not be allowed on the project.

1.7.5 Curing Equipment

Equipment for curing is specified in paragraph CURING.

1.7.6 Texturing Equipment

Texturing equipment shall be as specified below.

1.7.6.1 Fabric Drag

A fabric drag shall consist of a piece of fabric material as wide as the lane width securely attached to a separate wheel mounted frame spanning the paving lane or to one of the other similar pieces of equipment. The material shall be wide enough to provide 300 to 450 mm dragging flat on the pavement surface. The fabric material shall be clean, reasonably new burlap, kept clean and saturated during use.

1.7.7 Sawing Equipment

Equipment for sawing joints and for other similar sawing of concrete shall be standard diamond-tip-bladed concrete saws mounted on a wheeled chassis.

1.7.8 Straightedge

The Contractor shall furnish and maintain at the job site one 3.66 m straightedge for testing concrete surface smoothness. The straightedge shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles for operation on the pavement.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious materials shall be portland cement and shall conform to appropriate specifications listed below.

2.1.1 Portland Cement

Portland cement shall conform to ASTM C 150 Type II, low-alkali.

2.1.2 High-Early-Strength Portland Cement

High-early-strength cement shall conform to ASTM C 150 Type III, with C3A limited to 5 or 8 percent, low-alkali.

2.1.3 Pozzolan (Fly Ash)

Fly ash shall conform to ASTM C 618 Class F, including all the supplementary optional physical requirements.

2.2 AGGREGATES

Aggregates shall consist of clean, hard, uncoated particles meeting the requirements of ASTM C 33, including deleterious materials, abrasion loss and soundness requirements of ASTM C 33, and other requirements specified herein.

2.2.1 Coarse Aggregate

Coarse aggregate shall consist of crushed gravel, crushed stone, or a combination thereof. [The nominal maximum size of the coarse aggregate shall be 25.0 mm. When the nominal maximum size is greater than 25.0 mm, the aggregates shall be furnished in two ASTM C 33 size groups, No. 67 and No. 4. The amount of deleterious material in each size of coarse aggregate shall not exceed the limits shown in ASTM C 33 Class 1N, 4M or 4S, depending on the weathering region, and the following limits:

a. Lightweight particles 1.0 max. percent by mass (ASTM C 123).

b. Other soft particles 2.0 max. percent by mass (COE CRD-C 130).

c. Total of all deleterious 5.0 max. percent by mass (substances listed in ASTM C 33 and above, exclusive of material finer than 0.075 mm sieve).

d. The separation medium for lightweight particles shall have a density of 2.0 Mg/cubic meters.

2.2.2 Fine Aggregate

Fine aggregate shall consist of natural sand, manufactured sand, or a combination of the two, and shall be composed of clean, hard, durable particles. All fine aggregate shall be composed of clean, hard, durable particles meeting the requirements of ASTM C 33 and the requirements herein. The amount of deleterious material in the fine aggregate shall not exceed the limits in ASTM C 33and shall not exceed the following limits:

a. Lightweight particles (ASTM C 123) 1.0 percent max. by mass using a medium with a density of 2.0 Mg/cubic meter.

b. The total of all deleterious material types, listed in ASTM C 33 and above, shall not exceed 3.0 percent of the mass of the fine aggregate.

2.3 CHEMICAL ADMIXTURES

Air-entraining admixture shall conform to ASTM C 260. An accelerator shall be used only when specified in paragraph SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES and shall not be used to reduce the amount of cementitious material used. Accelerator shall conform to ASTM C 494Type C. Calcium chloride and admixtures containing calcium chloride shall not be used. A water-reducing or retarding admixture shall meet the requirements of ASTM C 494. Type G or H admixtures are not allowed.

2.4 CURING MATERIALS

Membrane forming curing compound shall be a white pigmented compound conforming to COE CRD-C 300. Burlap shall be new or shall be clean material never used for anything other than curing concrete.

2.5 WATER

Water for mixing and curing shall be clean, potable, and free of injurious amounts of oil, acid, salt, or alkali.

2.6 JOINT MATERIALS

2.6.1 Expansion Joint Material

Expansion joint filler shall be a preformed material conforming to ASTM D 1751. Expansion joint filler shall be 20 mm thick.

2.6.2 Contraction Joint Inserts

Sawable contraction joint inserts shall conform to COE CRD-C 540.

2.7 REINFORCING

2.7.1 General

Reinforcing bars shall conform to ASTM A 615/A 615M Grade 60. Bar mats shall conform to ASTM A 184/A 184M. Reinforcement shall be free from loose, flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce the bond with concrete.

2.8 DOWELS AND TIE BARS

2.8.1 Dowels

Dowels shall be single piece, plain (non-deformed) steel bars conforming to ASTM A 615/A 615M Grade 60 or higher. Dowels shall be free of loose, flaky rust and loose scale and shall be clean and straight.

2.8.2 Tie Bars

Tie bars shall be deformed steel bars conforming to ASTM A 615/A 615M Grade 60. Grade 60 or higher shall not be used for bars that are bent and straightened during construction.

2.9 EPOXY RESIN

All epoxy-resin materials shall be two-component materials conforming to ASTM C 881, Class as appropriate for each application temperature to be encountered; except, that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching for complete filling of spalls, wide cracks, and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed portland cement concrete, mortar, or freshly mixed epoxy resin concrete to hardened concrete shall be Type V, Grade as approved.

2.10 SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES

2.10.1 Specified Flexural Strength

Specified flexural strength, R, for concrete is 4,489 kPa at 14 days as determined by tests made in accordance with ASTM C 192/C 192M. Maximum allowable water-cementitious material ratio is 0.45. The water-cementitious material ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus

pozzolan, by the mass equivalency method described in ACI 211.1. The concrete shall be air-entrained with a total air content of 5 plus or minus 1 percentage points, at the point of placement. Air content shall be determined in accordance with ASTM C 231. The maximum allowable slump of the concrete at the point of placement shall be 75 mm for pavement constructed with fixed forms. For slipformed pavement, at the start of the project, the Contractor shall select a maximum allowable slump which will produce in-place pavement meeting the specified tolerances for control of edge slump.

2.10.2 Concrete Temperature

The temperature of the concrete as delivered shall conform to the requirements of paragraphs, Paving in Hot Weather and Paving in Cold Weather. Temperature of concrete shall be determined in accordance with ASTM C 1064.

2.10.3 Concrete Strength for Final Acceptance

The strength of the concrete will be considered acceptable when the average 14 day flexural strengths for each lot are above the "Specified Flexural Strength", and no individual set (2 beams per sublot) in the lot are 170 kPA or more below the "Specified Flexural Strength." If any lot or sublot, respectively, fails to meet the above criteria, the lot or sublot shall be removed and replaced at no additional cost to the Government.

2.11 MIXTURE PROPORTIONS BY CONTRACTOR

2.11.1 Composition

Concrete shall be composed of cementitious material, water, fine and coarse aggregates, and admixtures. The cementitious material shall be portland cement, or blended cement or only portland cement in combination with pozzolan. Pozzolan, if used, shall consist of not less than 15 percent of the cementitious material by mass and not more than 35 percent. The total portland cement content shall be at least 6.8 kg/cubic meter. Admixtures shall consist of air entrained admixture and may also include, as approved accelerator retarder water-reducing admixture. If water-reducer is used, it shall be used only at the dosage determined during mixture proportioning sutdies. High range water-reducing admixtures and admixtures to produce flowable concrete shall not be used.

2.11.2 Concrete Proportioning Studies, Pavement Concrete

Trial design batches, mixture proportioning studies, and testing requirements shall be the responsibility of the Contractor. Mixture proportioning studies shall be performed by a commercial laboratory, inspected by the Government, and approved in writing. The laboratory performing the mixture proportioning shall conform with ASTM C 1077. Strength requirements during mixture proportioning studies shall be based on flexural strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 78. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use on the project and shall be

accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in ACI 211.1, modified as necessary to accomodate flexural strength.

2.11.2.1 Water-Cement Ratio

At least three different water-cement ratios, which will produce a range of strength encompassing that required on the project, shall be used. The maximum allowable water-cement ratio required in paragraph Maximum Water-Cement Ratio will be the equivalent water-cement ratio as determined by conversion from the mass ratio of water to cement plus pozzolan, by the weight equivalency method as described in ACI 211.1. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent by mass of the total cementitious material, and the maximum shall be 35 percent. Laboratory trial mixtures shall be proportioned for maximum permitted slump and air content.

2.11.2.2 Trial Mixture Studies

Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any placing method proposed which requires special properties. The temperature of concrete in each trial batch shall be reported. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding. Concrete proportioning studies shall be performed using the following procedures:

2.11.2.3 Mixture Proportioning for 90 Day Flexural Strength

The following step by step procedure shall be followed:

a. Fabricate all beams for each mixture from the same batch or blend of batches. Fabricate and cure all beams in accordance with ASTM C 192/C 192M, using 152 by 152 mm beams.

b. Test beams in accordance with ASTM C 78.

c. Fabricate and cure test beams from each mixture for 7, 14, and 90-day flexural tests; 6 beams to be tested per age.

d. Using the average strength for each w/c at each age, plot all results from each of the three mixtures on separate graphs for w/c versus:

7-day flexural strength

14-day flexural strength

e. From these graphs select a w/c that will produce a mixture giving a 14 day flexural stregth equal to the required strengthy determined in accordance with paragraph "Average Flexural Strength Required for Mixtures."

f. No concrete pavement shall be placed until the Contracting Officer has approved the Contractor's mixture proportions.

2.11.3 Contractor Quality Control for Average Flexural Strength

The Contractor's day to day production shall be controlled (CQC) in accordance with the criteria herein, in the following subparagraphs, and in paragraph, "Concrete Strength Testing for CQC." This is entirely different from the acceptance requirements of paragraph "Concrete Strength for Final Acceptacne," and it is mandatory that both sets of requirements must be met. If at any time, the 14-day flexural strength, for any lot, is 410 kPa or more below the 'required average 14-day flexural strength', as specified below, the paving operation shall be stopped and the Contractor shall take necessary steps to improve the mixture proportioning, materials, or the batching and mixing to increase the strength. The paving operations shall not recommence until the Contracting Officer has approved the Contractor's proposed changes in writing.

PART 3 EXECUTION

3.1 CONDITIONING OF UNDERLYING MATERIAL

Underlying material,base course, upon which concrete is to be placed shall be clean, damp, and free from debris, waste concrete or cement, frost, ice, and standing or running water. After the underlying material has been prepared for concrete placement, no equipment shall be permitted thereon.

3.2 WEATHER LIMITATIONS

3.2.1 Hot Weather Paving

The temperature of concrete shall not exceed 32 degrees C. Steel forms, dowels and reinforcing shall be cooled prior to concrete placement when steel temperatures are greater than 49 degrees C.

3.2.2 Cold Weather Paving

The ambient temperature of the air at the placing site and the temperature of surfaces to receive concrete shall be not less 5 degrees C. The temperature of the concrete when placed shall be not less than 10 degrees C.

Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Calcium chloride shall not be used at any time. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 10 degrees C for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period. Pavement damaged by freezing shall be completely removed and replaced at the Contractor's expense as specified in paragraph, REPAIR, REMOVAL, AND REPLACEMENT OF SLABS.

3.3 CONCRETE PRODUCTION

3.3.1 General Requirements

Concrete shall be deposited in front of the paver within 45 minutes from the time cement has been charged into the mixing drum, except that if the ambient temperature is above 32 degrees C, the time shall be reduced to 30 minutes. Every load of concrete delivered to the paving site shall be accompanied by a batch ticket from the operator of the batching plant. Tickets shall show at least the mass, or volume, of all ingredients in each batch delivered, and the time of day. Tickets shall be delivered to the placing foreman who shall keep them on file and deliver them to the Government daily.

3.3.2 Transporting and Transfer-Spreading Operations

Non-agitating equipment shall be used only on smooth roads and for haul time less than 15 minutes. Equipment shall be allowed to operate on the underlying material only if no damage is done to the underlying material and its degree of compaction. Any disturbance to the underlying material that does occur shall be corrected before the paver-finisher reaches the location of the disturbance and the equipment shall be replaced or procedures changed to prevent any future damage.Additional water may be added to truck mixers to bring the slump within the specified range provided the mixture water-cement ratio is not exceeded.

3.4 PAVING

Pavement shall be constructed with paving and finishing equipment utilizing fixed forms or slipforms.

3.4.1 Consolidation

The paver vibrators shall be inserted into the concrete not closer to the underlying material than 50 mm. The vibrators or any tamping units in front of the paver shall be automatically controlled so that they shall be stopped immediately as forward motion ceases. Excessive vibration shall not be permitted. Concrete in small, odd-shaped slabs or in locations inaccessible to the paver mounted vibration equipment shall be vibrated with a hand-operated immersion vibrator. Vibrators shall not be used to transport or spread the concrete.

3.4.2 Operation

When the paver is operated between or adjacent to previously constructed pavement (fill-in lanes), provisions shall be made to prevent damage to the previously constructed pavement, including keeping the existing pavement surface free of any debris, and placing rubber mats beneath the paver tracks. Transversely oscillating screeds and extrusion plates shall overlap the existing pavement the minimum possible, but in no case more than 200 mm.

3.4.3 Required Results

The paver-finisher shall be operated to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. The paver-finishing operation shall produce a surface finish free of irregularities, tears, voids of any kind, and any other discontinuities. It shall produce only a very minimum of paste at the surface. Multiple passes of the paver-finisher shall not be permitted. The equipment and its operation shall produce a finished surface requiring no hand finishing, other than the use of cutting straightedges, except in very infrequent instances. No water, other than true fog sprays (mist), shall be applied to the concrete surface during paving and finishing.

3.4.4 Fixed Form Paving

Forms shall be steel, except that wood forms may be used for curves having a radius of 45 m or less, and for fillets. Forms may be built up with metal or wood, added only to the base, to provide an increase in depth of not more than 25 percent. The base width of the form shall be not less than eight-tenths of the vertical height of the form, except that forms 200 mm or less in vertical height shall have a base width not less than the vertical height of the form. Wood forms for curves and fillets shall be adequate in strength and rigidly braced. Forms shall be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire base. Forms shall not be set on blocks or on built-up spots of underlying material. Forms shall remain in place at least 12 hours after the concrete has been placed. Forms shall be removed without injuring the concrete.

3.4.5 Slipform Paving

The slipform paver shall shape the concrete to the specified and indicated cross section in one pass, and shall finish the surface and edges so that only a very minimum amount of hand finishing is required. Dowels shall not be installed by dowel inserters attached to the paver or by any other means of inserting the dowels into the plastic concrete.

3.4.6 Placing Reinforcing Steel

Reinforcement shall be positioned on suitable chairs securely fastened to the subgrade prior to concrete placement, or may be placed on an initial layer of consolidated concrete, with the subsequent layer placed within 30 minutes of the first layer placement.

3.4.7 Placing Dowels and Tie Bars

Dowels shall be installed with alignment not greater than 1 mm per 100 mm. Except as otherwise specified below, location of dowels shall be within a horizontal tolerance of plus or minus 15 mm and a vertical tolerance of plus or minus 5 mm. The portion of each dowel intended to move within the concrete or expansion cap shall be painted with one coat of rust inhibiting primer paint, and then oiled just prior to placement. Dowels and tie bars in joints shall be omitted when the center of the dowel or tie bar is located within a horizontal distance from an intersecting joint equal to or less than one-fourth of the slab thickness.

3.4.7.1 Contraction Joints

Dowelsandtie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal basket assemblies. The dowelsand tie bars shall be welded to the assembly or held firmly by mechanical locking arrangements that will prevent them from becoming distorted during paving operations. The basket assemblies shall be held securely in the proper location by means of suitable anchors.

3.4.7.2 Construction Joints-Fixed Form Paving

Installation of dowelsand tie bars shall be by the bonded-in-place method, supported by means of devices fastened to the forms. Installation by removing and replacing in preformed holes will not be permitted.

3.4.7.3 Dowels Installed in Hardened Concrete

Installation shall be by bonding the dowels into holes drilled into the hardened concrete. Holes approximately 3 mm greater in diameter than the dowels shall be drilled into the hardened concrete. Dowels shall be bonded in the drilled holes using epoxy resin injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel shall not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic collar fitted around the dowel. The vertical alignment of the dowels shall be checked by placing the straightedge on the surface of the pavement over the top of the dowel and measuring the vertical distance between the straightedge and the beginning and ending point of the exposed part of the dowel.

3.4.7.4 Expansion Joints

Dowels in expansion joints shall be installed by the bonded-in-place method or by bonding into holes drilled in hardened concrete, using procedures specified above.

3.5 FINISHING

Clary screeds, "bridge deck" finishers, or other rotating pipe or tube type equipment shall not be permitted. The sequence of machine operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, texturing, and then edging of joints. Hand finishing shall be used only infrequently and only on isolated areas of odd slab shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Equipment to be used for supplemental hand finishing shall primarily be 3 to 4 m cutting straightedges; only very sparing use of bull floats shall be allowed. At no time shall water be added to the surface of the slab in any way, except for fog (mist) sprays to prevent plastic shrinkage cracking.

3.5.1 Machine Finishing With Fixed Forms

The machine shall be designed to ride the forms. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

3.5.2 Machine Finishing With Slipform Pavers

If there is sufficient concrete slurry or fluid paste on the surface that it runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

3.5.3 Surface Correction

While the concrete is still plastic, irregularities and marks in the pavement surface shall be eliminated by means of cutting straightedges, 3 to 4 m in length. Depressions shall be filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. Long-handled, flat "bull floats" shall be used sparingly and only as necessary to correct minor, scattered surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Joints and edges shall not be overfinished.

3.5.4 Hand Finishing

Hand finishing operations shall be used only for those unusual slabs as specified previously. Grate tampers (jitterbugs) shall not be used. As soon as placed and vibrated, the concrete shall be struck off and screeded. The surface shall be tamped with a strike-off and tamping screed, or vibratory screed. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally. Long-handled, flat bull floats shall be used sparingly and only as necessary to correct surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Joints and edges shall not be overfinished. No water shall be added to the pavement during finishing operations.

3.5.5 Texturing

Before the surface sheen has disappeared and before the concrete hardens, the surface of the pavement shall be given a texture as described herein. Following initial texturing on the first day of placement, the Placing Foreman, Contracting Officer representative, and a representative of the Using Agency shall inspect the texturing for compliance with design requirements. After curing is complete, all textured surfaces shall be thoroughly power broomed to remove all debris. Any type of transverse texturing shall produce grooves in straight lines across each lane within a tolerance of plus or minus 13 mm of a true line. The concrete in areas of

recesses for tie-down anchors, lighting fixtures, and other outlets in the pavement shall be finished to provide a surface of the same texture as the surrounding area.

3.5.5.1 Wire-Comb Texturing

Surface texture transverse to the pavement center line shall be applied using a mechanical wire comb drag. The comb shall be capable of traversing the full width of the pavement in a single pass at a uniform speed and with a uniform pressure. Successive passes of the comb shall be overlapped the minimum necessary to obtain a continuous and uniformly textured surface. The scores shall be 2 to 5 mm deep, 1.5 to 3 mm wide, and spaced 10 mm apart.

3.5.6 Edging

The edges of slipformed lanes shall not be edged. After texturing has been completed, the edge of the slabs along the forms shall be carefully finished with an edging tool to form a smooth rounded surface of 3 mm radius. No water shall be added to the surface during edging.

3.6 CURING

Concrete shall be continuously protected against loss of moisture and rapid temperature changes for at least 7 days from the completion of finishing operations. Unhardened concrete shall be protected from rain and flowing water. During hot weather with low humidity and/or wind, the Contractor shall institute measures to prevent plastic shrinkage cracks from developing. ACI 305R contains means of predicting plastic shrinkage cracking and preventative measures. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry. Curing shall be accomplished by one of the following methods.

3.6.1 Membrane Curing

A uniform coating of white-pigmented membrane-forming curing compound shall be applied to the entire exposed surface of the concrete including pavement edges as soon as the free water has disappeared from the surface after finishing. If evaporation is high and no moisture is present on the surface even though bleeding has not stopped, fog sprays shall be used to keep the surface moist until setting of the cement occurs. Curing compound shall then be immediately applied. Curing compound shall be applied to the finished surfaces by means of a self-propelled automatic spraying machine, equipped with multiple spraying nozzles with wind shields, spaning the newly paved lane. The curing compound shall be applied at a maximum application rate of 5 square meters per L. The application of curing compound by hand-operated, mechanical powered pressure sprayers will be permitted only on odd widths or shapes of slabs where indicated and on concrete surfaces exposed by the removal of forms. The compound shall form a uniform, continuous, cohesive film that will not check, crack, or peel and that will be free from pinholes and other discontinuities. Areas where the curing compound develops the above defects or is damaged by heavy rainfall, sawing or other construction operations within the curing period,

shall be immediately resprayed.

3.6.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Impervious sheet curing shall not be used.

3.7 JOINTS

No deviation from the jointing pattern shown on the drawings shall be made without written approval of the Design District Pavement or Geotechnical Engineer. All joints shall be straight, perpendicular to the finished grade of the pavement, and continuous from edge to edge or end to end of the pavement with no abrupt offset and no gradual deviation greater than 13 mm.

3.7.1 Longitudinal Construction Joints

Dowels shall be installed in the longitudinal construction joints, or the edges shall be thickened as indicated.

3.7.2 Transverse Construction Joints

Transverse construction joints shall be installed at a planned transverse joint, at the end of each day's placing operations and when concrete placement is interrupted. Transverse construction joints shall be constructed either by utilizing headers and hand placement and finishing techniques, or by placing concrete beyond the transverse construction joint location and then saw cutting full depth and removing concrete back to the transverse construction joint location. For the latter case, dowels shall be installed using methods for dowels installed in hardened concrete described above. All transverse construction joints shall be dowelled.

3.7.3 Expansion Joints

Expansion joints shall be formed where indicated, and about any structures and features that project through or into the pavement, using preformed joint filler of the type, thickness, and width indicated, and shall extend the full slab depth. Edges of the concrete at the joint face shall be edged. The joint filler strips shall be installed to form a recess at the pavement surface to be filled with joint sealant. Expansion joints shall be constructed with thickened edges for load transfer.

3.7.4 Slip Joints

Slip joints shall be installed the full depth of the slab using expansion joint preformed joint filler material attached to the face of the original concrete placement. A reservoir for joint sealant shall be constructed at the top of the joint. Edges of the joint face shall be edged.

3.7.5 Contraction Joints

Transverse and longitudinal contraction joints shall be of the weakened-plane or dummy type. Longitudinal contraction joints shall be constructed by sawing a groove in the hardened concrete with a power-driven saw. Transverse contraction joints shall be constructed in conformance with requirements for sawed joints.

3.7.5.1 Sawed Joints

Sawed contraction joints shall be constructed by sawing a groove in the concrete with a 3 mm blade to the indicated depth. The time of initial sawing shall vary depending on existing and anticipated weather conditions and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. Sawing at a given joint location shall be discontinued when a crack develops ahead of the saw cut. Immediately after the joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. The surface shall be resprayed with curing compound as soon as free water disappears. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed with cord or backer rod before the concrete in the region of the joint is resprayed with curing compound.

3.7.5.2 Insert-Type Joints

Insert-type joints shall not be used for slipformed pavements. Insert-type non-metallic contraction joints shall be constructed by installing a preformed insert in the plastic concrete to form a weakened plane to induce cracking. Inserts shall be installed using a machine equipped with a vibrating bar for cutting a groove in the plastic concrete for placement of the insert or for vibrating the insert into place at the prescribed joint location. The installed insert shall be perpendicular to the finished grade of the pavement, with the top of the insert not more than 3 mm below the pavement surface.

3.7.6 Thickened Edge Joints

Underlying material in the transition area shall meet the requirements for smoothness and compaction specified for all other areas of the underlying material.

3.7.7 Special Joints

Special joints (undercut joints) shall be constructed adjacent to existing pavement as indicated. The concrete shall be worked under the edge of the existing pavement to completely fill the void and shall be thoroughly consolidated by the use of hand-held vibrators.

3.8 REPAIR, REMOVAL, AND REPLACEMENT OF SLABS

New pavement slabs that contain full-depth cracks shall be removed and

replaced, as specified herein at no cost to the Government. Removal and replacement shall be full depth, shall be full width of the paving lane, and the limit of removal shall be from each original transverse joint . The Contracting Officer will determine whether cracks extend full depth of the pavement and may require minimum 150 mm diameter cores to be drilled on the crack to determine depth of cracking. Cores shall be drilled and the hole later filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin. Drilling of cores and refilling holes shall be at no expense to the Government. Cracks that do not extend full depth of slab shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1. The Contractor shall ensure that the crack is not widened during epoxy resin injection. Where a full depth crack intersects the original transverse joint, the slab(s) containing the crack shall be removed and replaced, with dowels installed, as required below. Spalls along joints shall be repaired as specified.

3.8.1 Removal and Replacement of Full Slabs

Unless there are keys or dowels present, all edges of the slab shall be sawcut full depth. If keys, dowels, or tie bars are present along any edges, these edges shall be sawed full depth 150 mm from the edge if only keys are present, or just beyond the end of dowels or tie bars if they are present. These joints shall then be carefully sawed on the joint line to within 25 mm of the depth of the dowel or key. The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. The narrow strips along keyed or doweled edges shall be carefully broken up and removed. Care shall be taken to prevent damage to the dowels, tie bars, or keys or to concrete to remain in place. Protruding portions of dowels shall be painted and lightly oiled. The joint face below keys or dowels shall be suitably trimmed so that there is no abrupt offset. If underbreak occurs at any point along any edge, the area shall be hand-filled with concrete, producing an even joint face from top to bottom, before replacing the removed slab. If underbreak over 100 mm deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels, tie bars, or keys on an edge, or where they have been damaged, dowels of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete. Original damaged dowels or tie bars shall be cut off flush with the joint face. All four edges of the new slab shall thus contain dowels or original keys or original tie bars. Prior to placement of new concrete, the underlying material shall be graded and recompacted, and the surfaces of all four joint faces shall be cleaned of all loose material and contaminants, and coated with a double application of membrane forming curing compound as bond breaker. Placement of concrete shall be as specified for original construction. The resulting joints around the new slab shall be prepared and sealed as specified.

3.8.2 Repairing Spalls Along Joints

Spalls along joints and cracks shall be repaired by first making a vertical saw cut at least 25 mm outside the spalled area and to a depth of at least 50 mm. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out

to remove all unsound concrete. The cavity shall be thoroughly cleaned with high pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Prime coat for portland cement repairs shall be a neat cement grout and for epoxy resin repairs shall be epoxy resin, Type III, Grade 1. The cavity shall be filled with low slump portland cement concrete or mortar, or with epoxy resin concrete or mortar. Portland cement concrete shall be used for larger spalls, those more than 0.009 cubic meter in size after removal operations; portland cement mortar shall be used for spalls between 0.00085 and 0.009 cubic meter; and epoxy resin mortar or Type III, Grade 3 epoxy resin for those spalls less than 0.00085 cubic meter in size after removal operations. Portland cement concretes and mortars shall be very low slump mixtures, proportioned, mixed, placed, tamped, and cured. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions, mixing, placing, tamping and curing procedures as recommended by the manufacturer. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints.

3.8.3 Areas Defective in Plan Grade or Smoothness

In areas not meeting the specified limits for surface smoothness and plan grade, high areas shall be reduced to attain the required smoothness and grade, except as depth is limited below. High areas shall be reduced by grinding the hardened concrete with a surface grinding machine after the concrete is 14 days or more old. The depth of grinding shall not exceed 6 mm. All pavement areas requiring plan grade or surface smoothness corrections in excess of the specified limits, shall be removed and replaced. In pavement areas given a wire comb or tined texture, areas exceeding 2 square meters that have been corrected by rubbing or grinding shall be retextured by grooving machine sawn grooves meeting the requirements for the wire comb or tined texture. All areas in which grinding has been performed will be subject to the thickness tolerances specified in paragraph Thickness. Any grinding performed on individual slabs with excessive deficiencies shall be performed at the Contractor's own decision without entitlement to additional compensation if eventual removal of the slab is required.

3.9 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR

Existing concrete pavement shall be removed as indicated and as specified in Section 02220 DEMOLITION modified, and expanded as specified herein. Removal, repair and replacement shall be made as indicated and as specified in paragraph REPAIR, REMOVAL, AND REPLACEMENT OR SLABS.

3.10 PAVEMENT PROTECTION

The Contractor shall protect the pavement against all damage prior to final acceptance of the work. Traffic shall be excluded from the new pavement.

As a construction expedient in paving intermediate lanes between newly paved pilot lanes, operation of the hauling equipment will be permitted on the new pavement after the pavement has been cured for 7 days and the joints have been sealed or otherwise protected. All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean. Special cleaning and care shall be used where Contractor's traffic uses or crosses active airfield pavement.

3.11 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL (CQC)

Paragraph ACCEPTABILITY OF WORK contains additional CQC requirements. The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and submit reports as specified. When, in the opinion of the Contracting Officer, the paving operation is out of control, concrete placement shall cease.

3.11.1 Batch Plant Control

A daily report shall be prepared indicating checks made for scale accuracy with test weights, checks of batching accuracy, and corrective action taken prior to and during placement for weighing or batching, type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water masses per cubic meter, amount of water as free moisture in each size of aggregate, and the batch aggregate and water masses per cubic meter for each class of concrete batched during each day's plant operation.

3.11.2 Concrete Mixture

a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two other tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of paving. Whenever air content reaches specified limits, an immediate confirmatory test shall be made. If the second test also shows air content at or exceeding specified limits, an adjustment shall immediately be made in the amount of air-entraining admixture batched to bring air content within specified limits. If the next adjusted batch of concrete is not within specified limits, concrete placement shall be halted until concrete air content is within specified limits.

b. Slump Testing. Slump tests shall be made when test specimens are fabricated. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Whenever slump approaches the maximum limit, an adjustment shall immediately be made in the batch masses of water and fine aggregate, without exceeding the maximum w/(c+p). When a slump result exceeds the specification limit, no further concrete shall be delivered to the paving site until adjustments have been made and slump is again within the limit.

c. Temperature. The temperature of the concrete shall be measured

when strength specimens are fabricated.

3.11.3 Concrete Strength Testing for CQC

Contractor Quality Control operations for concrete strength shall consist of the following steps:

a. Take samples for strength tests at the paving site. Fabricate and cure test beams in accordance with ASTM C 31/C 31M; test them in accordance with ASTM C 78.

b. Fabricate and cure 2 test beams per sublot from the same batch or trukload and at the same time acceptance beams are fabricated and test them for flexural strength at 7-day age.

c. Average all 8 14-day flexural tests per lot.

d. Compare the 14-day strength for the lot is below the Average Flexural Strength Required for Mixtures from paragraph of same title.

e. If the average 14-day strength for the lot is below the Average Flexural Strength Required for Mixtures by 138 kPa flexural strength or more, at any time, adjust the mixture to increase the strength, as approved.

f. If the average 14-day strength is above the Average Flexural Strength Required for Mixtures by 138 kPa flexural strength or more for 2 consecutive days, the Contractor will be permitted to adjust the mixture to decrease the strength, as approved.

g. The Contractor's CQC testing agency shall maintain up-to-date control charts for strength, showing the 7-day CQC flexural strength, the 14-day flexural strength (from acceptance tests) and the 7, 14, and 90-day equivalent flexural strength results of each lot.

3.11.4 Inspection Before Placing

Underlying materials, joint locations and types, construction joint faces, forms, reinforcing, dowels, and embedded items shall be inspected by a Registered Engineer in sufficient time prior to each paving operation in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing, and the certification signed by the Registered Engineer, prior to each days' paving.

3.11.5 Paving Operations

The placing foreman shall supervise all placing and paving operations, shall determine that the correct quality of concrete is placed in each

location as shown, shall insure that the concrete is consolidated full depth and that finishing is performed as specified. The placing foreman shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume of concrete placed, and method of paving and any problems encountered.

3.11.6 Curing Inspection

a. Moist Curing Inspections. Each day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded. When any inspection finds an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for the area shall be extended by 1 day.

b. Membrane Curing Inspection. At the end of each day's placement, the CQC Representative shall determine the quantity of compound used by measurement of the container; shall determine the area of concrete surface covered; shall then compute the rate of coverage in square meters per L and shall also note whether or not coverage is uniform. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

3.11.7 Cold-Weather Protection

At least once per day, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

3.11.8 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report, signed by a registered engineer, shall be prepared for the updating of control charts and test data, and all CQC inspections and actions covering the entire period from the start of the construction through the current week. Reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all CQC records. A copy of weekly reports shall be faxed to the Design District Pavement or Geotechnical Engineer. At the completion of concrete placement, a certification report shall be prepared containing mix designs, all updated control charts and concrete test data, quality control reports, smoothness reports, and other pertinent data on the concrete, with a certification by a registered engineer that the concrete placed meets all specification requirements. A copy of the certification report shall be mailed to the Design District pavement or Geotechnical Engineer.

-- End of Section --